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CONFERENCE ON INTERSTATE POLLUTION OF NORTH FORK HOLSTON RIVER, HELD AT KINGSPORT, TENNESSEE, ON SEPTEMBER 28, 1960

Public Health Service
Washington, D. C.

28 September 1960

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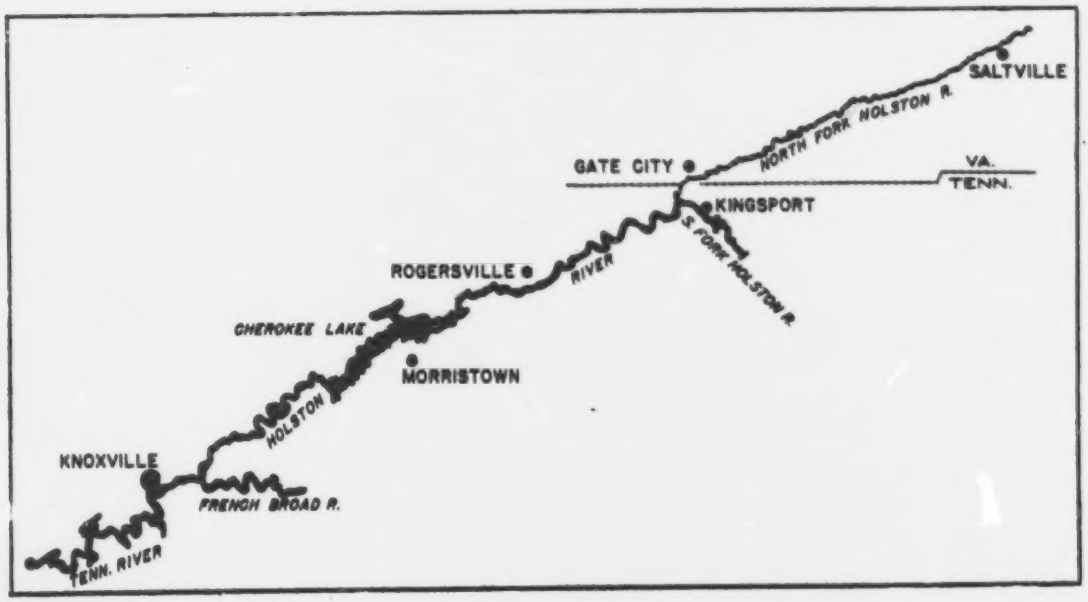
CONFERENCE

ON

INTERSTATE POLLUTION

OF

NORTH FORK HOLSTON RIVER



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KINGSPORT, TENNESSEE

SEPTEMBER 28, 1960

C O N F E R E N C E

In the matter of pollution of the interstate waters of North Fork of the Holston River, held at the Kingsport Utilities Conference Room, Kingsport, Tennessee, on

September 28, 1960.

MURRAY STEIN, Chairman,
Public Health Service,
Washington, D. C.

HOWARD W. CHAPMAN, Regional Engineer,
Public Health Service,
Atlanta, Georgia.

DR. R. H. HUTCHESON, Chairman of the
Tennessee Pollution Control Board,
Nashville, Tennessee.

ROSS WALKER, Chairman of the
State Water Control Board of Virginia,
Richmond, Virginia.

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CHAIRMAN STEIN: The conference is open.

This conference in the matter of pollution of the interstate waters of the North Fork of the Holston River is being held under the provisions of the Federal Water Pollution Control Act. Under the provisions of that Act, the Surgeon General of the Public Health Service is required to call a conference of this type when he is requested to do so by an official state water pollution control agency or when on the basis of surveys, reports, etcetera, he has reason to believe that pollution subject to abatement under the Federal Act is occurring.

In response to a request from the Tennessee Stream Pollution Control Board to the Surgeon General to hold a conference in this area on the North Fork of the Holston River, and on the basis of reports, surveys and studies, the Surgeon General has called this conference.

The purpose of the conference is to bring together the State Water Pollution Control Agencies, the Public Health Service, and other interested parties to review the existing situation, the progress which has been made, and in order to lay a basis for future action by all parties concerned, and to give the states, localities and industries an opportunity to take any remedial action which may be indicated under state and local laws.

This conference mechanism is a time tested and proven technique. It is used by many states informally in the normal conduct of business in the field of water pollution control. As long ago as 1921 the United States Supreme Court in a famous interstate pollution case, New York against New Jersey, said, and I quote:

> "We cannot withhold the suggestion inspired by the consideration of this case that the grave problems of sewage disposal presented

> by the large and growing population living on the shores of New York Bay is one more likely to be wisely solved by cooperative study and by conference and mutual concession on the part of representatives of the states so vitally interested in it than by proceeding in any court, however constituted."

This, we think, may be equally applicable to the situation we have under consideration here now.

Under Section 8 of the Federal Water Pollution Control Act, the Surgeon General has notified the official state Water Pollution Control Agencies of this conference. These agencies are represented here. Representatives of these agencies are privileged, of course, to bring whomever they wish to the conference and have them participate in it.

I would like to make this clear. This, under the law, is a conference between the representatives of the official state agencies and the Public Health Service. The other participants in this conference are here at the invitation of the states.

The conferees representing the states and the Federal government have been designated and they are as follows:

Dr. R. H. Hutcheson, Chairman of the Tennessee Stream Pollution Control Board.

Mr. Ross Walker, Chairman of the State Water Control Board of Virginia.

Mr. Howard W. Chapman, Regional Engineer of the Public Health Service, of its headquarters in Atlanta, Georgia.

My name is Murray Stein and I am from Headquarters of the Public Health Service, Washington, D. C.

Both the states and the federal government have

responsibilities in dealing with interstate water pollution control problem. The Federal Water Pollution Control Act declares that the states have primary rights and responsibilities for taking action to abate and control interstate pollution. It has always been the policy of the Public Health Service to give full recognition of this traditional role of the states. The function of the Service is to encourage the states in this activity. However, the Public Health Service is charged by law with specific responsibilities in connection with interstate pollution control problems. The Federal Water Pollution Control Act provides that pollution of interstate waters, whether the matter causing or contributing to such pollution is discharged directly into such waters, or reaching such waters after discharged into a tributary of such waters, which endangers the health and/or welfare of persons in a state other than that in which the discharge originates, shall be subject to abatement.

Under the Federal Act, the Surgeon General is required at the conclusion of the conference to prepare a summary of the conference, which will be sent to all conferees, the summary according to law must include the following:

1. Occurrence of pollution of interstate waters subject to abatement under the Act;

2. Adequacy of measures taken to an abatement of the pollution; and

3. Nature of delays, if any, being encountered in abating the pollution.

Where a situation does not lend itself to the covering of all these points at one session of the conference, we have held conferences in two sessions. The succeeding session is held on the call of the Chairman after a reasonable opportunity has been given to develop additional information. If such is the case here, it is suggested that consideration might be given to designating today's proceeding as the first session

of the conference and scheduling the second session in the future.

Now, a word about the procedure governing the conduct of the conference. A recording and transcript will be made of the conference. Mrs. Gustava Smith is making a verbatim report of these proceedings for the purpose of aiding us in preparing the summary, and also providing a record of what is being said and done here. We will make copies of the summary of the conference and a verbatim transcript of the conference available to the state representatives. All others who wish to get copies will receive them through their appropriate state agencies, which will distribute them. This is in accordance with the judicial policy of the Service to work with the states in these areas.

All the conferees will be called upon to make statements. The conferees, in addition, may call upon participants they have invited to the conference to make statements. At the conclusion of such statements, the conferees will be given an opportunity to comment or ask questions, and at the conclusion of which the Public Health Service conferees may ask a question or two. In the past, this procedure has proven effective in developing a clear statement of the problem and reaching agreement on an equitable solution.

For the purpose of those who are not familiar with this procedure, we in the Public Health Service measure our success by the cases which are solved at the conference table and I think our record has been pretty good in that regard. However, at the conclusion of this conference -- this may be after the first or second session, as the case may be, and the conferees may decide -- the Surgeon General is required by law to make recommendation for remedial action, if he deems that appropriate. I don't know that he will be ready for that now, but ultimately the Surgeon General will have to make recommendations as to remedial action. In the past, the Surgeon General has always accepted the recommendations of the conferees at conferences of this kind, when he has made these recommendations.

In order to start, I think we will call on the Public Health Service to make a general presentation. Before we do that, I would like to point out that we have a map of the general area here, a diagram of the Holston Ordnance Works, and several other charts, and all participants should feel free to use these exhibits as they may wish.

If anyone other than a conferee is called, we would ask that he speak from the lectern to the conferees and announce his name and affiliation for the purpose of the record.

I now call on Mr. Chapman for the Public Health Service presentation.

MR. CHAPMAN: Mr. Chairman and fellow conferees, before making our statement, I would like to recognize our Regional Medical Director in the Region IV area of the Public Health Service, Dr. W. H. Aufranc. And, also Mr. Lloyd Gebhard, who is the Public Health Service's Regional Program Director of the Water Supply and Pollution Control Program in Charlottesville, Virginia, of which the State of Tennessee is a part.

CHAIRMAN STEIN: Virginia -- for the purpose of the record, I would like to correct the record.

This conference involves two regions. Virginia is served by our Charlottesville region, and Tennessee by our region with headquarters in Atlanta, and Mr. Gebhard is the representative of the Public Health Service Region which serves Virginia.

MR. CHAPMAN: Thank you for that correction.

The Chairman has presented the official interest and responsibilities of the States and the Public Health Service in this matter of interstate pollution on the North Fork of Holston River. The States and the Public Health Service, which are represented here today, share the responsibility for assessing the problem and proposing remedial measures to abate the pollution that is

found to exist. The waters of the Holston River Valley have been under surveillance by many groups for many years. The first extensive studies were conducted by the Health and Safety Division of the Tennessee Valley Authority during the period 1937-1939. In its report covering these studies, the following paragraph appears:

"At Saltville the stream (North Fork Holston River) receives the industrial waste from a large chemical manufacturing plant. No information was obtained on the amount of these wastes, nor of their chemical contents. The results of the mineral analyses of samples collected, however, indicate large increases in calcium, sodium and chlorides. The calcium materially increases the hardness of the Knoxville water supply."

Other studies were published by the Tennessee Valley Authority in 1944 and 1952. The statements in these reports reflect the same condition as the original report.

In 1950 the Public Health Service published a summary report on water pollution of the Tennessee River drainage basin, which was a cooperative state and federal report. In this report, it was stated that,

> "The North fork of the Holston River receives little organic waste, but the water is unsuitable for public water supplies and other purposes due to inorganic dissolved solids discharged by industry."

In addition, the Public Health Service has written revised reports on the North Fork in 1952 and 1957. The situation has remained substantially the same during this period of time and to the present.

The State of Virginia has made various studies in regard to this matter. Tennessee also has conducted repeated surveys on the quality of the North Fork. In addition, water treatment plant operators records

downstream along the Holston in Tennessee tell a convincing story of the effects of pollution coming from upstream.

Mr Francis W. Kittrell, who is in charge of Pollution Evaluation of the Technical Service Branch of our Sanitary Engineering Center in Cincinnatti, recently reviewed the present pollution problem in the North Fork of the Holston. Mr. Kittrell has had wide experience in this area, having worked for both the Tennessee Valley Authority's Health and State Division, and the Tennessee State Health Department, prior to his association with the Public Health Service.

I would like now to call on Mr. Kittrell for his report.

MR. KITTRELL: In 1894 the Mathieson Alkali Works was established at Saltville, Virginia, on the North Fork Holston River in southwestern Virginia. Since that time the plant has continuously produced soda ash from the extensive underground salt deposits by use of the amonia-soda process.

This operation has led to a stream pollution problem of long duration. Evidence of the continuing problems attributed to this operation is contained in voluminous files of both the state health departments and the stream pollution control agencies of both Virginia and Tennessee dating back to at least 1924.

In late 1924 the problem was dramatically brought to the attention of numerous agencies and individuals when the dike of the lagoon in which calcium and chloride wastes were stored broke and released a tremendous slug of wastes to the North Fork Holston River. The effects of this accident were felt as far as the Chattanooga, Tennessee, water plant, some 425 miles downstream.

Although the waste lagoon has been reinstalled on a sound engineering basis and controlled discharge of the wastes in proportion to the flow of North Fork Holston River has been improved in recent years,

complaints regarding the effects of these wastes on water uses have continued to the present.

A major fish kill in the North Fork Holston River, below Saltville, in late 1946 brought the pollution problem to the attention of the newly formed Virginia Water Control Board. Negotiations between the Water Control Board and company officials were initiated shortly thereafter and continued at intervals from then until January of 1960. Three official hearings on the problem were held during the period 1953 through 1956 and there have been numerous appearances of representatives of the company before the Board since that time.

On December 13, 1956, the Virginia Control Board issued a special order to the company. This order specified, among other things, that the company should take steps to hold chloride concentrations in the North Fork Holston River below a maximum of 5,000 p.p.m. and that the company should present evidence to show why it was not feasible to reduce the wastes discharged by:

1. Evaporation and recovery of calcium chloride.

2. Conversion of at least a portion of the manufacturing process to electrolytic production of sodium hydroxide and chlorine.

3. Provision of additional settling capacity.

About three years later, in January 1960, the company presented evidence to show that it had complied with the special order of the Water Control Board in regard to maintenance of chloride concentrations not in excess of 5,000 p.p.m. Additional evidence was presented to show that none of the suggested methods for reduction in total chlorides was feasible. The evidence included a statement that underground disposal of the wastes in the Saltville area likewise was not feasible.

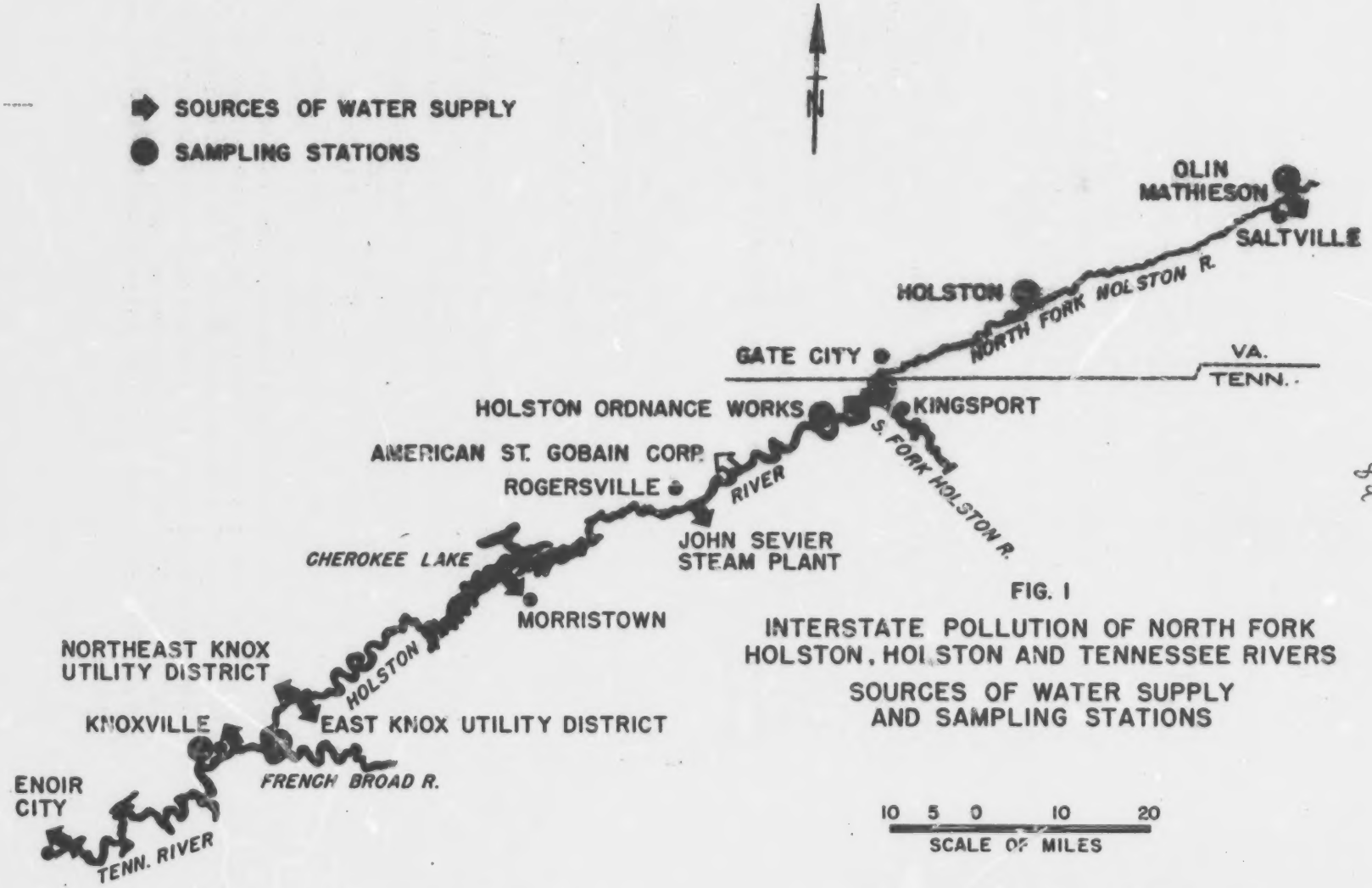

FIG. 1

INTERSTATE POLLUTION OF NORTH FORK HOLSTON, HOLSTON AND TENNESSEE RIVERS

SOURCES OF WATER SUPPLY AND SAMPLING STATIONS

The technical staff of the Water Control Board stated that they had considered the company's evidence and had concluded there were no feasible methods presently available for significant reduction of the waste short of closing down the plant.

On May 31, 1960, the Tennessee Stream Pollution Control Board requested the U. S. Public Health Service to hold a conference on pollution of the interstate waters of North Fork Holston River under the provisions of Public Law 660.

This report presents: information regarding the wastes discharged by the plant of the Olin Mathieson Chemical Corporation (formerly The Mathieson Chemical Corporation) to the North Fork Holston River at Saltville, Virginia; uses of the waters of the North Fork Holston River and of the Holston and Tennessee Rivers as far downstream as Lenoir City, Tennessee, about 275 stream miles below Saltville; and effects of the wastes on water uses.

The area dealt with in this report is shown in Figure 1, which includes the streams involved, the points on the streams at which principal sources of analytical data are available, and principal points at which water is withdrawn for municipal and industrial uses.

The North Fork Holston River rises in Bland County, Virginia, and flows in a generally southwesterly direction to the Virginia/Tennessee state line near Kingsport, Tennessee. The river crosses the state line about 4.5 miles above its confluence with the South Fork Holston River, where the Holston River is formed. The distance from this confluence of the stream to Saltville is 82 miles. The Holston River flows in a generally southwesterly direction for 142 miles to Knoxville, Tennessee, where it joins the French Broad River to form the Tennessee River. The Tennessee River flows past Knoxville in a generally southwesterly direction to Lenoir City, Tennessee, which is 52 miles below the confluence of the Holston and French Broad Rivers.

Four major reservoirs exert a direct effect on stream flows in portions of the stream system involved.

Fort Patrick Henry Reservoir on the South Fork Holston River, just above Kingsport, controls the flow of the South Fork and has an important bearing on dilution of the highly mineralized waters of the North Fork.

Cherokee Reservoir impounds about one-third of the length of the Holston River and controls the flow of the Holston at its mouth and at its confluence with the French Broad River. This reservoir provides long-time storage of the water and accomplishes considerable equalization of upstream variations in water quality.

Douglas Reservoir on the French Broad River, about 30 miles above its mouth, controls the flow of the French Broad at its confluence with the Holston River. Control of flows by this reservoir and by Cherokee Reservoir has an important bearing on the relative proportions of the two rivers and resulting water quality in the combined waters that form the Tennessee River at the Knoxville Water Plant intake.

Fort Loudoun Reservoir, between Knoxville and Lenoir City, provides relatively short-term storage of the Tennessee River and controls its flow at Lenoir City.

Water uses of the streams involved include: municipal water supply; industrial water supply; recreation, including fishing, boating and swimming; power production; navigation; agriculture, including stock watering and supplemental irrigation; and waste disposal.

All reaches of the streams involved are used, or, in the absence of interference by pollution, are potentially useful for swimming, fishing, boating, stock watering, and supplemental irrigation.

Municipal water supplies are taken from the streams involved at: Holston River at Morristown, Tennessee, Northeast Knox Utility District, East Knox

Utility District; Tennessee River at Knoxville, Tennessee, and Lenoir City, Tennessee.

Major industrial water supplies taken directly from the streams include: on North Fork Holston River, the Olin Mathieson Chemical Corporation, Saltville, Virginia; on Holston River, the Holston Ordnance Works, Kingsport, Tennessee, and TVA, John Sevier Steam Plant, Rogersville, Tennessee.

The American-St. Gobain Corporation, Greenland Plate Glass Plant, is being constructed on the Holston River between Rogersville and Surgoinsville, Tennessee, and proposes to take its water supply from the Holston River.

In addition, there are numerous industries in Morristown, Knoxville, and Lenoir City which take their water supplies from the municipal systems.

Power is produced at Cherokee Dam on the Holston River and at Fort Loudoun Dam on the Tennessee River.

Navigation is an important use of Fort Loudoun Reservoir on the Tennessee River.

The Olin Mathieson Chemical Corporation plant at Saltville produces soda ash by the ammonia-soda process. The principal waste from this process contains large quantities of calcium and sodium chlorides. It is these constituents that have led to the complaints of pollution downstream from Saltville. In subsequent discussion of the effects of the wastes consideration will be given to calcium as reflected in hardness (expressed as $CaCO_3$), to chlorides, and to sodium.

All of these constituents are contained to some extent in most natural surface waters. Hardness may range between 20 and 200 p.p.m. in the tributary streams of the watersheds involved. In general, the tributaries originating in the mountain areas to the East tend to be quite soft, while those originating in the central and western portions of the watershed generally tend to

be much harder. Chlorides and sodium in the tributary water usually are quite low and average only a few p.p.m. regardless of the areas in which the tributaries originate.

For convenience in presenting the data, the three constituents may be assigned to six principal sources:

1. Olin Mathieson Chemical Corporation, Saltville, Virginia.

2. North Fork Holston River, above Saltville, Virginia.

3. Tributaries of the North Fork Holston River, Saltville to the south.

4. South Fork Holston River.

5. Tributaries of the Holston River, confluence North and South Forks to the mouth.

6. French Broad River at the mouth.

Table 1 presents the quantities of hardness as $CaCO_3$, chlorides as Cl, and sodium as Na in pounds per day from the six principal sources. These data also are presented in Figure 2.

These data are based on stream analyses made principally during the five year period, 1952 through 1956. This period was selected because of the excellent five year record of analyses available on water from the North Fork Holston River at Holston, Virginia, from the publications of the U. S. Geological Survey. Most of the analytical results for other sampling stations on the river system, which were used, also were obtained during the same period.

In Table 2 the quantities of these materials are totalled for the Tennessee River at the Knoxville Water Plant intake and percentages of these totals for each of the constituents from each source also are

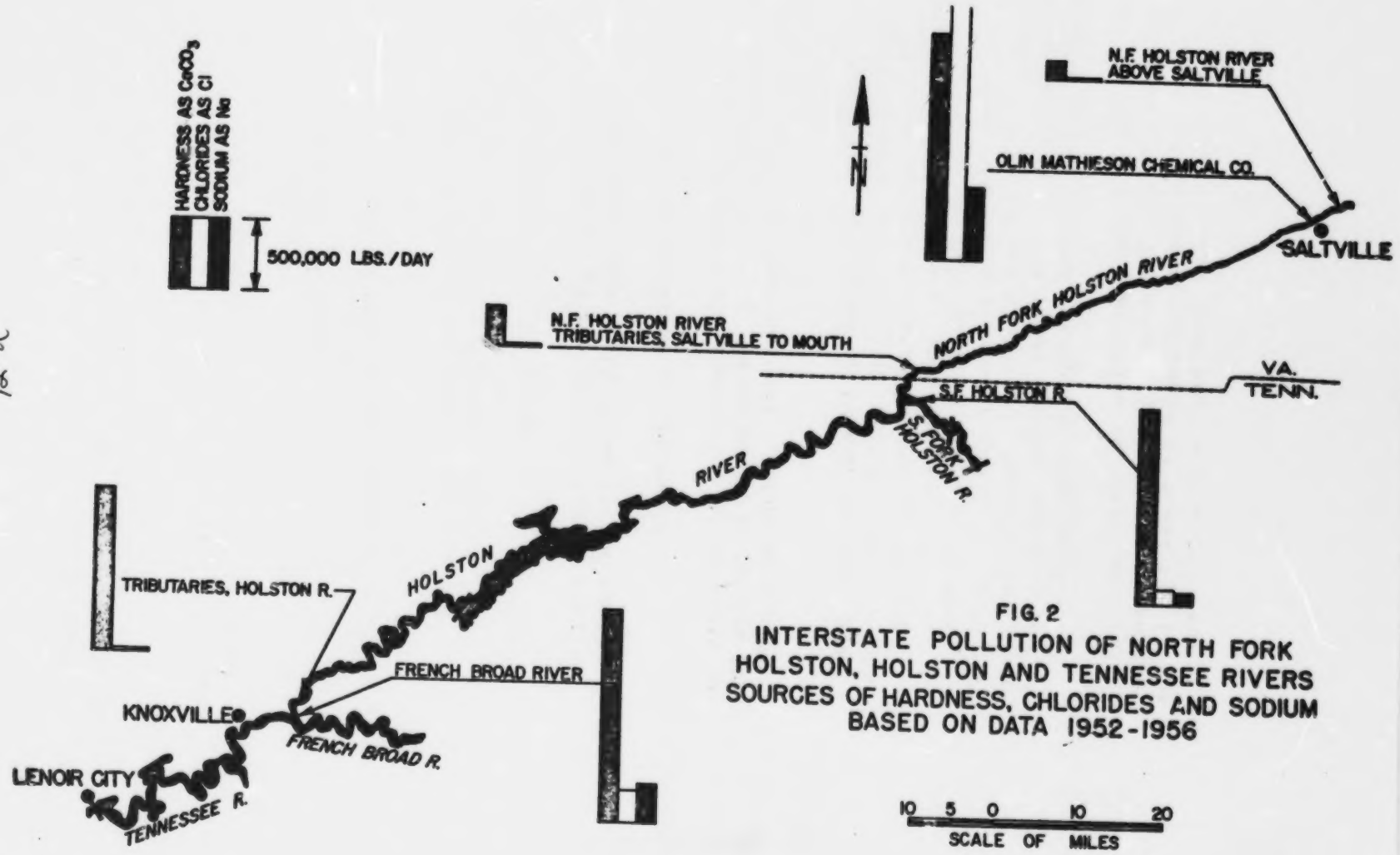

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FIG. 2

INTERSTATE POLLUTION OF NORTH FORK HOLSTON, HOLSTON AND TENNESSEE RIVERS SOURCES OF HARDNESS, CHLORIDES AND SODIUM BASED ON DATA 1952-1956

TABLE I

Sources of Hardness, Chlorides and Sodium
Based on Data for 1952 - 1956

	Hardness as $CaCo_3$		Chlorides as Cl		Sodium as Na	
	M-Lbs./day	% of Total	M-Lbs./day	% of Total	M-Lbs./day	% of Total
Olin Mathieson Chem. Corp.	1595.	26.2	1841.	84.0	478.	57.3
North Fork Holston River						
Above Saltville	113	1.8	2.4	0.1	1.6	0.2
Tributaries, Saltville to mouth	291	4.8	5.6	0.3	2.8	0.3
South Fork Holston River	1395	22.9	95.9	4.4	81.2	9.7
Holston River Tributaries	1153	18.9	12.9	0.6	6.4	0.8
French Broad River	1550	25.4	232.	10.6	265.	31.7
Total (at Knoxville, Tenn.)	6097	100.0	2189.8	100.0	835.0	100.0

12-A1

given.

These percentages show that the Olin Mathieson wastes are the largest single source of each of the three constituents.

Incidentally, on this chart the red bar represents hardness, the green bar represents chloride, and the blue bar represents sodium. The legend on the left indicates by the height of the bar the equivalent of 500,000 pounds per day of each of the constituents.

During the period 1952 through 1956, this plant contributed an average of 1,595,000 pounds per day of hardness, or 26.2% of the total at Knoxville; 1,841,000 pounds per day of chlorides, or 84% of the total; and 478,000 pounds per day of sodium, or 57.3% of the total. The second major source of these constituents at Knoxville was the French Broad River which accounted for 60% of the total flow of the Tennessee River at Knoxville during the period. This source contributed 1,550,000 pounds per day, or 25.4% of the total hardness, 232,000 pounds per day, or 10.6% of the chlorides, and 265,000 pounds per day, or 31.7% of the sodium. Other significant contributions were 22.9% of the hardness, contributed by the South Fork Holston River, and 18.9% of the hardness, contributed by tributaries to the Holston River. Contributions of the three constituents from other sources were minor.

Table 2 presents concentrations of hardness, chlorides and sodium at selected points on the river system. Included in the table are percentages of each of the constituents contributed by the Olin Mathieson wastes. The concentrations in this table are averages of actual data at points where analytical data are available. At other points of water use, where analytical data were not available, the concentrations have been computed from the quantities shown in Table 1 and the average stream flows at the selected points in Table 2. Considerable confidence is felt in both the observed and the computed concentrations since they agree very well with values obtained by routing water

TABLE 2

AVERAGE ANNUAL CONCENTRATIONS OF HARDNESS, CHLORIDES, AND SODIUM
FROM NATURAL SOURCES AND PERCENTAGES FROM OLIN MATHIESON CHEM. CORP.

LOCATION	RIVER MILE	AVG. ANNL. FLOW-cfs	HARDNESS as $CaCO_3$ Total mg/l	%fr. O.M.	CHLORIDES as Cl^- Total mg/l	%fr.O.M.	SODIUM as Na^+ Total mg/l	% fr. O.M.
N.Fk. Holston R. Abv. Saltville, Va.	(NH-81.1)	261	101	0.0	2.0	0.0	1.85	0.0
Blw. Olin Mathieson	(NH-78.1)	261	2230*	93.5	2450*	99.8	611*	99.6
Holston, Va.	(NH-58.1)	465	1825	87.7	2005	99.7	500	99.3
Gate City, Va.	(NH-8.8)	781	1240	80.2	1070	99.6	321*	98.9
S.Fk. Holston R. At Mouth	(SH-0.5)	2150	108	0.0	8.9	0.0	7.0*	0.0
Holston River Blw. Confl. N. and S. Fk. Holston R.	(H-137.9)	2930	216	47.2	133	94.7	36*	84.8
Rogersville, Tenn.	(H-104.2)	3370	210*	41.8	107*	94.5	31*	84.4
Morristown, Tenn.	(H-75.2)	3750	207*	38.2	96*	94.3	28*	84.2
At Mouth	(H-5.5)	4120	204*	35.2	88*	94.1	26*	83.9
French Broad River At Mouth	(FB-7.5)	6120	47	0.0	7.0	0.0	8.0	0.0
Tennessee River At Knoxville, Tenn.	(T-649.2)	10,240	106	26.2	39	84.0	15.1*	57.3
At Lenoir City, Tenn.	(T-601.6)	-	106	26.2	39	84.0	15.1*	57.3

* Calculated values.

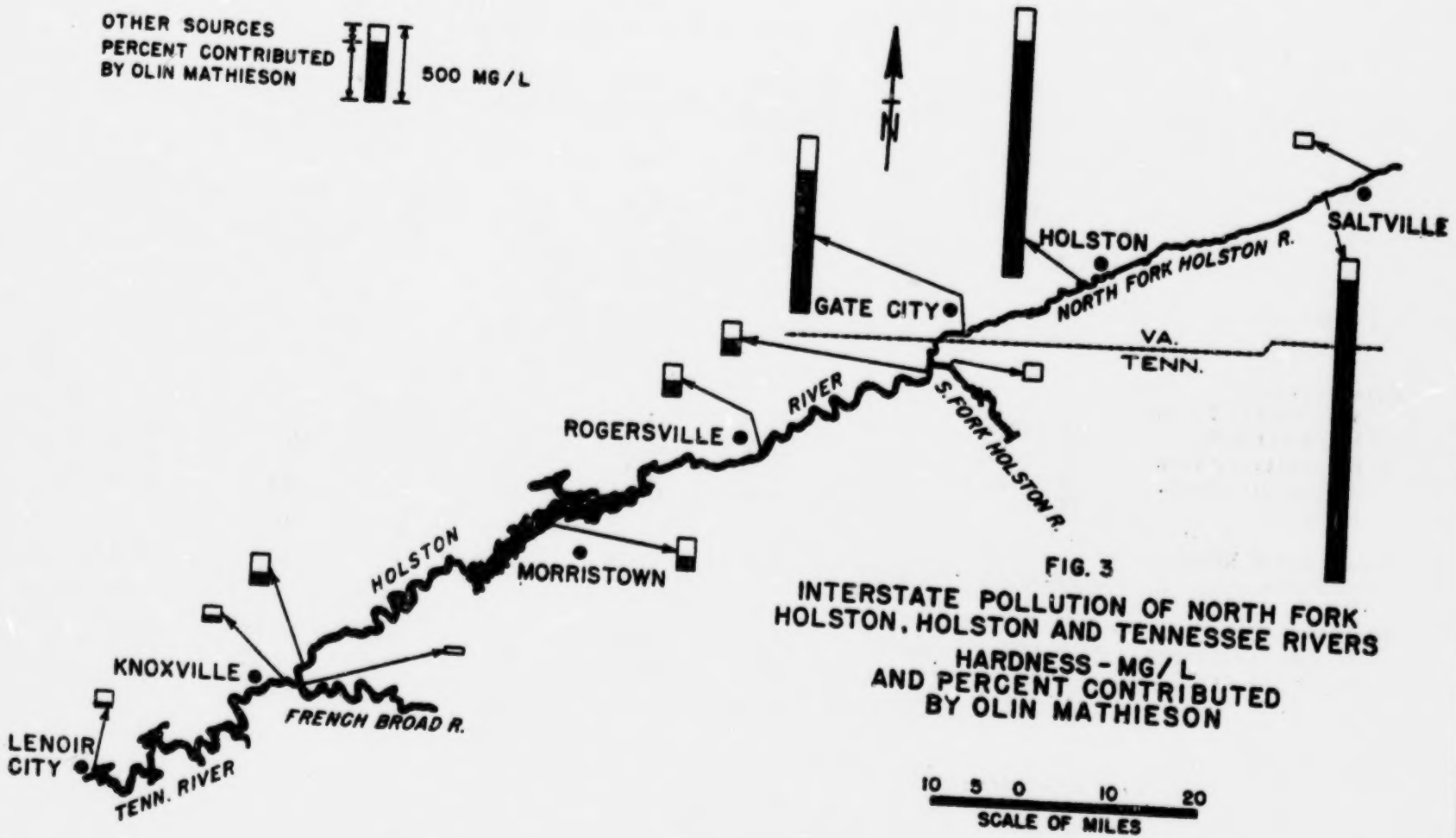

FIG. 3
INTERSTATE POLLUTION OF NORTH FORK HOLSTON, HOLSTON AND TENNESSEE RIVERS
HARDNESS - MG/L
AND PERCENT CONTRIBUTED
BY OLIN MATHIESON

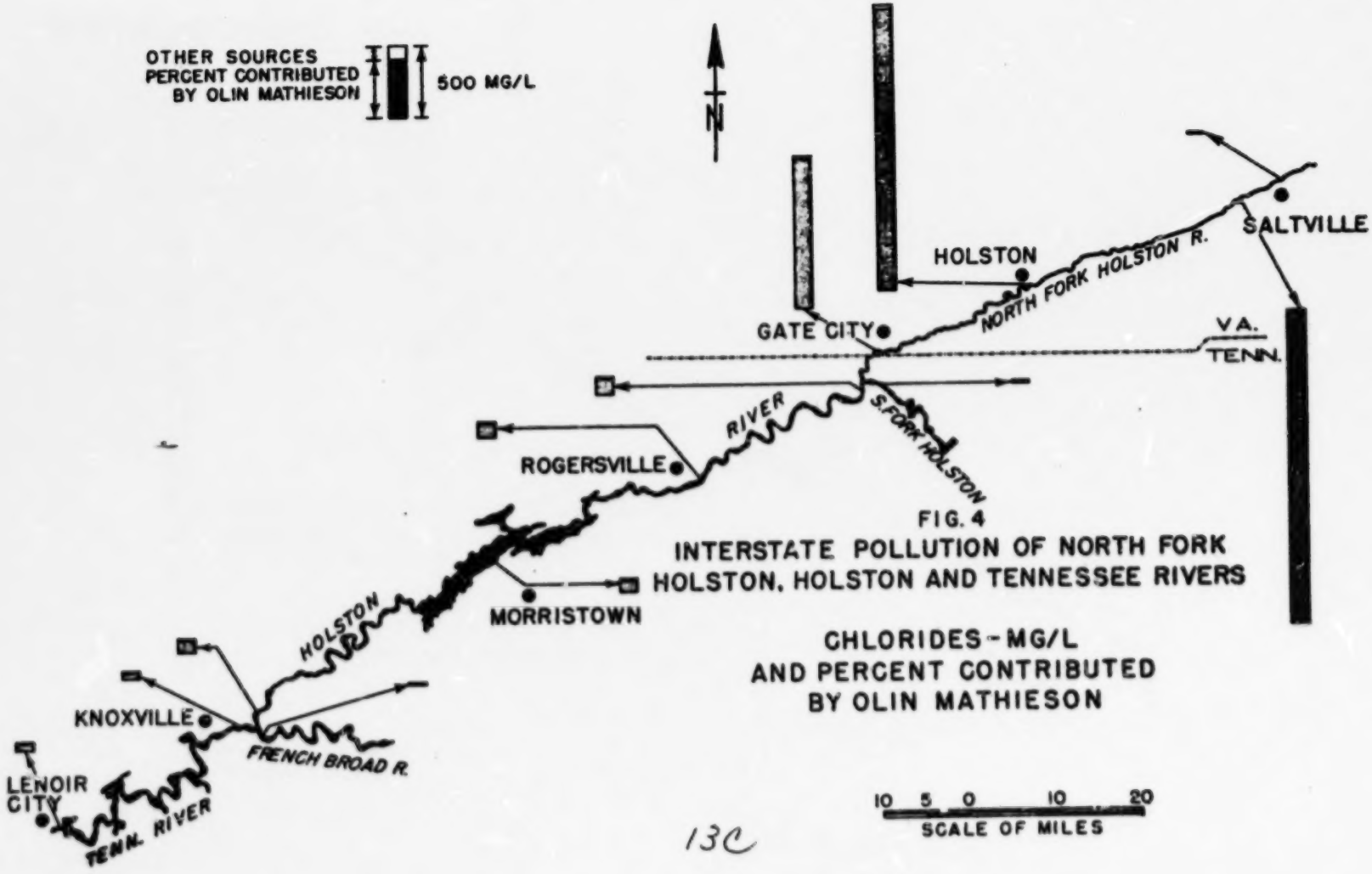

FIG. 4
INTERSTATE POLLUTION OF NORTH FORK HOLSTON, HOLSTON AND TENNESSEE RIVERS

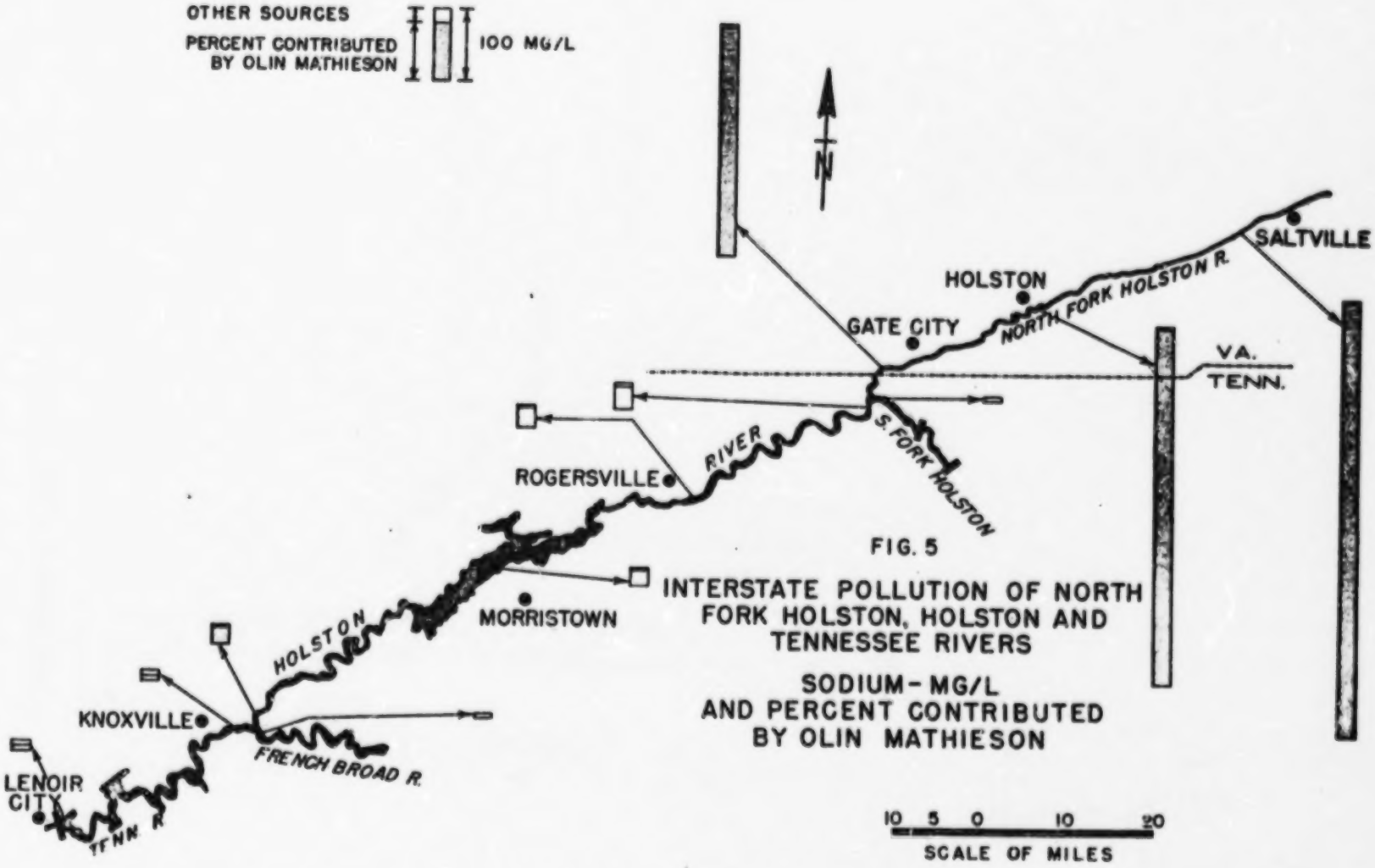

FIG. 5

INTERSTATE POLLUTION OF NORTH FORK HOLSTON, HOLSTON AND TENNESSEE RIVERS

SODIUM - MG/L AND PERCENT CONTRIBUTED BY OLIN MATHIESON

down the river system from Saltville to Knoxville on a month-to-month basis for the five year period.

The data are presented also in Figures 3 through 5.

Above Saltville, the North Fork Holston River had an average hardness of 101 mg/1, an average chloride content of 2 mg/1, and an average sodium of 1.85 mg/1.

Immediately below the waste discharge from the Olin Mathieson plant, the average hardness increased to 2,230 mg/1, chlorides to 2,450 mg/1, and sodium to 611 mg/1. The concentrations at Holston, Virginia, were 1,825 mg/1 of hardness, 2,005 mg/1 of chlorides, and 500 mg/1 of sodium.

Near Gate City, Virginia, which is about four miles above the Virginia/Tennessee state line, the average hardness was 1,240 mg/1, chlorides were 1,070 mg/1, and sodium 321 mg/1.

The South Fork Holston River provided approximately a 3 to 1 dilution of the flow of the North Fork and reduced the hardness immediately below their confluence to 216 mg/1, chlorides to 133 mg/1, and sodium to 36 mg/1.

Tributaries of the Holston River provided additional dilution which reduced hardness to 204 mg/1, at the mouth of the river, chlorides to 88 mg/1, and sodium to 26 mg/1.

The soft water of the French Broad River, with a hardness of 47 mg/1, joins the Holston River to form the Tennessee, about three miles above the Knoxville Water Plant intake. The average hardness of the raw water at the intake was 106 mg/1, the average chlorides were 39 mg/1, and the average sodium was 15.1 mg/1. There is relatively little dilution of the Tennessee River by tributary flow between Knoxville and Lenoir City and it is assumed that the concentrations of the

three constituents at the Lenoir City water plant intake are essentially the same as those at the Knoxville intake.

The figures also indicate the portions of concentrations contributed by the Olin Mathieson wastes. In each case, the vertical bar represents the total concentration, and the blue portion of the bar indicates the portion contributed by the Olin Mathieson wastes. Near Gate City and the Virginia/Tennessee state line, the wastes contributed 80 per cent of the hardness. At points on the Holston River the waste contributed 47 per cent of the hardness at the upper end and 35 per cent at the mouth of the river. At Knoxville the wastes contributed 26 per cent of the hardness.

Near the Virginia/Tennessee state line the Olin Mathieson wastes accounted for 99.6 per cent of the chlorides. On the Holston River the percentages contributed by the wastes dropped slightly from 94.7 per cent at the upper end of the river to 94.1 per cent at the mouth. At Knoxville Water Plant intake the wastes contributed 84 per cent of the chlorides.

Just above the Virginia/Tennessee state line the Olin Mathieson wastes accounted for 98.9 per cent of the sodium. In the Holston River the percentages contributed by the wastes dropped slightly from 84.8 per cent at the upper end to 83.9 per cent to the mouth. At the Knoxville Water Plant intake the wastes accounted for 57.3 per cent of the sodium.

The foregoing average concentrations represent only a portion of the total effects of the Olin Mathieson wastes on water quality. In addition to the high concentrations involved, the wide and sometimes rapid fluctuations in concentrations which occur add to the difficulties involved in treating the water to combat the adverse effects. These fluctuations are caused by natural variations in stream flow of the North Fork Holston River, by variations in discharge of the wastes from the plant, and by the controlled discharge involved in peaking power operations of the Fort Patrick Henry,

Cherokee, and Douglas Reservoirs. The magnitudes of these fluctuations are illustrated by the following values at selected points.

On the North Fork Holston River at Holston, Virginia, where the hardness averaged 1,825 mg/1, during 1952 through 1956, individual values ranged from 108 to 4,870 mg/1. Five per cent of the values were in excess of 4,000 mg/1, and twenty-five per cent were in excess of 2,900 mg/1. Chlorides, which averaged 2,005 mg/1, varied between 42 and 5,400 mg/1. Five per cent of the values were in excess of 4,500 mg/1, and twenty-five per cent were in excess of 3,300 mg/1.

On the Holston River, near the upper end, the hardness ranged from 94 to 599 mg/1 compared to the average of 216 mg/1. Five per cent of the values exceeded 420 mg/1, and twenty-five per cent exceeded 240 mg/1. Chlorides varied between 5 and 560 mg/1 compared to the average of 133 mg/1. Five per cent of the values exceeded 330 mg/1, and twenty-five per cent exceeded 170 mg/1. Of especial interest is the fact that twelve per cent of the values exceeded 250 mg/1, which is the U. S. Public Health Service recommended limit for chlorides in municipal water supplies. Data on sodium at this point were limited but it is reasonable to assume that the range of sodium around its average of 36 mg/1 was similar to the range of chlorides around its average. On this basis sodium would vary approximately in the range of 5 to 100 mg/1.

At the Knoxville Water Plant intake, the hardness ranged from 44 to 219 mg/1 compared to the average of 106 mg/1. Five per cent of the values exceeded 150 mg/1 and twenty-five per cent exceeded 126 mg/1. Chlorides ranged between 1 and 140 mg/1 compared to the averages of 39 mg/1. Five per cent of the values were in excess of 79 mg/1 and twenty-five per cent were in excess of 57 mg/1.

Excessive hardness exerts detrimental effects on many uses of water for both municipal and industrial

purposes.

The principal effect with respect to municipal supplies is the added cost to domestic consumers for soap and synthetic detergents used in washing and cleaning. Many consumers in towns having excessively hard municipal supplies choose to soften the water with Zeolite softening equipment. In addition, excessive hardness exerts somewhat less tangible effects. It may interfere with satisfactory laundering of clothes, toughen some boiled vegetables, increase the cost of heating water for household use, decrease the life of cooking utensils, and cause excessive deposits in pipes and in faucets which reduce their carrying capacities.

If a municipality provides softening at a municipal plant, the city is subjected to additional capital cost and added costs for operation in excess of those necessary for normal coagulation, sedimentation, filtration and disinfection. The calcium chloride hardness discharged by the river system by the Olin Mathieson plant is more expensive to remove by conventional municipal softening processes than is natural calcium bicarbonate hardness. The calcium chloride hardness must be precipitated with soda ash, which is about three times as expensive as the lime used for removal of calcium bicarbonate hardness.

Interferences by excessive hardness with industrial processes are many and varied. Probably the single most important interference is the effect on use of boiler-feed water. Preparation of hard water for use in boilers can be quite expensive, especially if the boilers are of the high pressure type. Specific industries which require relatively soft water for manufacturing processes include: textiles, ice manufacturing, soft drink bottling, and vegetable canning.

Excessive chlorides likewise can cause deleterious effects in both municipal and industrial uses of water.

The U. S. Public Health Service has recommended a limit of 250 mg/l of chlorides in water used for municipal supplies. Concentrations of chlorides in excess of this may impart a salty taste to the water.

In industrial supplies excessive chlorides may contribute to corrosion of metal equipment with which the water comes in contact. High chlorides are objectionable especially in boilers producing high pressure steam. Specific industries in which excessive chlorides may interfere in the manufacturing process include glass making and metal working.

A high sodium content of water used for municipal purposes may be injurious to persons suffering certain types of heart, liver and kidney diseases. Some doctors may prescribe a patient's total daily intake of sodium from all sources should not exceed 500 mgs. Since it is difficult to limit sodium intake in food to this low value, any significant concentration of sodium in the municipal supply adds to the problem and the patient may be forced to use distilled water. If the patient lives in a home where the water is softened by the Zeolite process, the calcium and magnesium portions of the hardness are replaced by sodium, and therefore excessive hardness may contribute indirectly to the over-all problem.

Although specific objectives for hardness, chlorides and sodium have not been officially adopted for the river system by either the Virginia Water Control Board or the Tennessee Stream Pollution Control Board, the staff of the Virginia Water Control Board has suggested that an ultimate chloride objective for the North Fork Holston River at its mouth should be a limit of 125 mg/l. The staff of the Tennessee Stream Pollution Control Board has suggested that hardness in the Holston River should not exceed 100 mg/l, and chlorides should not exceed 50 mg/l.

Specific Effects.

North Fork Holston River below Saltville.

Numerous complaints have been submitted to the Virginia Water Control Board involving several miles of the river below the point at which the Olin Mathieson wastes are discharged. These complaints included: fish kills or the absence of fish; refusal of cattle to drink river water; corrosion of farm machinery which fords the river; cloudy or murky appearance of the river; and muck on the bottom of the river and on the banks following high water.

Pine Grove, Virginia. In 1950 an industrial consultant inquired regarding the suitability of the quality of the North Fork Holston River in the Pine Grove to Mendota section of the river as a source of supply for a synthetic liquid fuel plant and asked whether there were any plans for reduction of calcium and sodium chloride wastes. In reply, the Executive Secretary of the Virginia Water Control Board said that the water was not suitable as a potable and industrial source, and that there were no specific plans for improvement at that time. The plant thus far has not located in this area.

Mendota, Virginia. It has been claimed by a local citizen that two industrial plants were lost to this area because of the quality of the river water. It is possible that one of these plants was the synthetic liquid fuel plant referred to above.

Washington County, Virginia. In 1948 the Washington County Wildlife Conservation Association claimed that an industrial plant had been lost to Washington County because of water quality of the North Fork Holston River.

Scott County, Virginia. In 1947 a consultant requested information from the Virginia Department of Public Health regarding the suitability of the North Fork Holston River as a source of domestic water supply for a southeastern area in Scott County. The request was turned over to the Executive Secretary of the Virginia Water Control Board who replied that the river was not suitable as a source of domestic water supply.

North Kingsport Utilities District, Kingsport, Tennessee. This utilities district serves water to about 1,500 domestic customers. The consultant who planned the water system has stated that he would have used the North Fork Holston River as the source of supply if the quality had been suitable. It was necessary instead to develop local springs as the source of supply. The supply from the springs is limited and it is anticipated that water requirements within the next five to six years may exceed the present capacity. No other known natural sources of water are available for the utilities district.

Kingsport, Tennessee. In making the preliminary survey of available sources of water for the Kingsport Municipal Supply, the consulting sanitary engineer concluded that the North Fork Holston River was desirable as a source from the standpoint of topography, flow and sanitary water quality. After having a sample of the river water analyzed, he decided that its mineral content rendered it unsuitable and instead designed the water system to use the South Fork Holston River as the Source of supply. This stream was selected in preference to the North Fork in spite of the existence of several communities and several plants which were discharging untreated sewage and industrial wastes to the South Fork Holston River or its tributaries upstream from Kingsport.

Holston Ordnance Works, Kingsport, Tennessee. The Holston Ordnance Works, Plant B, was established on the west side of the Holston River, a short distance below Kingsport during World War II. Although the Holston River would have been the logical source of water for the large quantities of steam necessary for this operation, the consulting engineer on water supply concluded that the mineral quality of the Holston River was unsuitable. Hardness was the most deleterious constituent.

In order to obtain boiler feed water of more suitable quality, a dike system was installed between the confluence of the north and south forks of the

Holston River to keep the north and south fork waters separate to the Holston Ordnance Works intake. In spite of the relatively high load of organic pollution in the South Fork Holston River from Kingsport and its industries, it was decided that the south fork water would be more suitable for boiler feed water than would the mixture of water from the two streams. In order to obtain south fork water, after installation of the dike system, it was necessary to construct a submerged intake line under the river to the east side of the stream.

Following the war years, the plant was placed on a stand-by basis and partial operation was not resumed until 1951. During the intervening period, the dike had deteriorated and allowed interchange of water between the north and south forks. An attempt was made to operate without repairing the dikes until 1953. During this two year period, hardness at the water plant intake often reached levels of 700 to 800 mg/1. The water softening equipment, with a capacity of 128,000 gallons per hour, was designed to treat water with a maximum of 145 mg/1 of hardness. On one occasion the hardness was so high, and the softeners so overloaded that nearly a month's supply of salt was used to regenerate the softeners during a two-day period. The available supply of salt was exhausted and in order to remain in operation, it was necessary to purchase table quality salt from all available dealers in the surrounding area.

In 1953 the dike was repaired and has been maintained since that time. No abnormal problems because of hardness of the water supply have arisen since then.

Total capital costs necessary to obtain South Fork Holston River water have been:

Initial installation of dike	$15,643.00
Replacement of dike (1953)	28,750.00
Intake line	105,047.00
Total capital costs	$149,440.00

In addition, it has been necessary to make an engineering survey to determine where additional water could be obtained if the plant were required to go into full production. This was necessary because there are times when the South Fork Holston River does not provide enough flow to meet the needs of the plant at full production. The cost of the consultant's report on this problem was about $30,000. The report suggested three possible solutions which would involve capital costs in the range of $130,000 to $227,000. The solution with the lowest capital cost of $130,000 would have the highest annual operating cost of about $1,000,000 per year.

An additional cost to the Holston Ordnance Works has been $5,000 per year for maintenance of the dike during the last seven years, for a total of $35,000.

American-St. Gobain Corporation - Greenland Plate Glass Plant. This company has started the construction of a large glass plant on the Holston River between Rogersville and Surgoinsville, Tennessee. Plans are to use the Holston River as a source of water supply. The chloride content of the Holston River water presents a potential need for costly water treatment to combat the chloride problem.

A representative of the company has stated that the chloride content of the river will make the glass grinding operation difficult to control uniformly and estimated that the added cost of constant attention and adjustment necessary may equal $7,000 to $8,000 per year, plus the possibility of an indeterminate production loss.

If peak chloride concentrations should prove to be high enough to necessitate de-mineralization for the grinding operation, it is anticipated that de-mineralizing equipment will cost about $40,000 and that operation of the equipment will cost $148,000 per year.

There are other processes where chlorides may prove to be objectionable. If it should become necessary to de-mineralize the entire water supply, it is estimated that the cost would be $730,000 per year initially, and with expanded production, this could increase to $1,460,000 per year.

Rogersville, Tennessee. A past president of the Rogersville Chamber of Commerce has stated that three prospective plants have been lost in this area because of unsatisfactory water quality in the Holston River. At least one of these was stated to have a potential employment of 1,000 to 1,200 persons.

The Executive Secretary of the Tennessee Stream Pollution Control Board has stated that another large company was interested in a plant site in this area but lost interest after obtaining information on the water quality of the Holston River.

TVA - John Sevier Steam Plant, Rogersville, Tennessee. When this plant was in the design stage, both the consultant on water supply and the manufacturer of softening equipment advised the design personnel for TVA that the Holston River water would not be suitable for boiler feed water at times when peaks of total dissolved solids exceeded 650 mg/l, or when total anions and cations exceeded 500 to 700 mg/l. It was determined that these conditions were exceeded when the conductivity of the river water exceeded 550 micromhos.

In order to meet this problem, the TVA impounded a small creek near the plant and installed continuous conductivity recording equipment on the river and pumps to deliver river water to the impoundment. Water is taken from the Holston for boiler feed make-up when the conductivity from the river is less than 550 micromhos. Water also is pumped from the river to the impoundment, when needed, when the conductivity is below this level. When conductivity exceeds 550 micromhos, boiler feed make-up water is drawn from the impoundment.

In spite of these precautions, it has been necessary on three occasions since 1956 to call for special releases of water from Fort Patrick Henry Reservoir on South Fork Holston River to provide dilution for the excessively mineralized water. Recently the level of the impoundment, which serves as the auxiliary source, has been increased by two feet and it is hoped that this additional storage will avoid the necessity for the special releases from Fort Patrick Henry Reservoir.

The capital cost of the necessary installation was $50,000 and annual operating cost has been estimated at $500 per year.

Morristown, Tennessee. This town obtains water from the Holston River, a well, a spring, and a small creek. About 75 to 80 per cent of the water is pumped from the Holston River.

The old conventional coagulation, sedimentation, rapid sand filtration treatment and disinfection plant is being replaced in stages. Plans are to complete replacement in about three years. The final plant will incorporate provisions for softening. The sanitary engineering consultant has stated he would not recommend softening if the hardness of the raw water source was reduced by 90 to 100 mg/l.

It is estimated that the additional facilities necessary for softening will involve a capital cost of $35,000 to $40,000 In addition, annual operating costs to remove the hardness caused by calcium chloride from the Olin Mathieson plant will be about $11,000 per year.

It is estimated that the cost of extra soap and synthetic detergents used by the Morristown municipal supply domestic consumers is about $33,000 per year. Other less tangible losses bring the total cost to the water consumers to an estimated $59,000 per year.

Northeast Knox Utility District, Knoxville, Tennessee. This relatively newly formed utility district

takes water from the Holston River a few miles above its mouth. It is estimated that the extra cost of soap and synthetic detergents plus intangible losses borne by the 1700 consumers of this supply, because of hardness added by the Olin Mathieson wastes, is about $4,900 per year.

East Knox Utility District, Knoxville, Tennessee. This utility district takes water from the Holston River a few hundred yards below the intake for the Northeast Knox Utility District. The East Knox Utility District also has about 1700 consumers and it is estimated that they also are subjected to excessive costs of $4,900 per year because of Olin Mathieson wastes.

Knoxville, Tennessee. The municipal water supply for Knoxville takes water from the Tennessee River about three miles below the confluence of the Holston and French Broad Rivers. The system supplies water to about 175,000 domestic customers plus numerous commercial and industrial users.

It is estimated that extra soaps and synthetic detergents used by these consumers because of the hardness added by the Olin Mathieson wastes cost $110,000 per year. Added intangible losses bring the total cost to $198,000 per year.

At least two of the industries using the Knoxville municipal water supply have stated that chlorides caused interference with their processes. One of these claims that excessive chlorides caused spots on the brass products manufactured by the plant. The other industry stated that excessive chlorides interferred with their process for silvering mirrors. No estimates of costs to these two plants are available.

Two of the numerous commercial users of water from the municipal supply have estimated the increased cost of softening due to Olin Mathieson wastes to be a total of $2,150 per year.

Lenoir City, Tennessee. The municipal supply for Lenoir City is taken from the Tennessee River a short distance below Fort Loudon Dam. The quality of water at this point is essentially the same as that used by the Knoxville Water Supply. It is estimated that the cost of extra soap and synthetic detergents and intangible losses borne by the 7,500 customers of this municipal supply because of Olin Mathieson wastes is $8,500 per year.

SUMMARY AND CONCLUSIONS.

The Olin Mathieson Chemical Corporation plant at Saltville, Virginia, discharges wastes containing large quantities of calcium and sodium chloride which are produced in the manufacture of soda ash by the ammonia-soda process. During the period 1952 through 1956, the wastes contained an average of 1,670,000 pounds per day of calcium chloride and about 1,245,000 pounds per day of sodium chloride. Hardness, due to the calcium chloride plus a small quantity of magnesium compound, was equivalent to 1,590,000 pounds per day of hardness as calcium carbonate. Total chlorides were 1,841,000 pounds per day and total sodium was 478,000 pounds per day.

As far downstream as Knoxville, Tennessee, about 225 river miles below Saltville, these wastes contributed an estimated 26 per cent of the total hardness, 84 per cent of the chlorides, and 57 per cent of the sodium. Percentages of these constituents in the North Fork Holston River near the Virginia/Tennessee state line were about 80 per cent of the total hardness and 99 per cent of the chlorides and sodium. In the Holston River the percentages were about 40 per cent of the hardness, 94 per cent of the chlorides, and 84 per cent of the sodium.

In the North Fork Holston River, for several miles below Saltville, it has been reported that the Olin Mathieson wastes have: reduced fish through both kills and decreased propagation; interferred with agricultural pursuits including stock watering, and

the transportation of farm equipment across the river; and imparted a milky turbidity to the river, and covered its bottom and banks with muck.

The additional hardness, imparted to downstream municipal water supplies by the wastes, has caused inconvenience to water consumers and has cost them an estimated $275,000 per year in added soap and synthetic detergent usage, and associated intangible losses.

Because of the added hardness, downstream industries have had to bear capital cost of at least $200,000 to combat the hardness. In prospect other total capital costs in the range of $210,000 to $307,000 may be spent by one municipality and two industries.

A new industry starting construction of a plant on the Holston River is faced with possible annual water treatment costs to combat chlorides estimated to be in the range of $148,000 to $1,460,000.

At least three areas have been denied the use of North Fork Holston River water as the preferred source for municipal supplies. Two of these areas are in Tennessee.

On the basis of this investigation, it would appear that the greatest loss to the region adjacent to the North Fork Holston River and the Holston River has been the loss of industries that found the water of these two streams unsuitable for their use. Reports indicate that water quality has been an important factor in adverse decisions involving at least seven plants for which sites along the North Fork Holston River and Holston River were considered.

It is evident that pollution of the North Fork Holston River by the Olin Mathieson Chemical Corporation constitutes pollution of interstate waters subject to abatement under the Federal Water Pollution Control Act, as such pollution endangers the health or welfare of persons in a state other

than that in which the discharge contributing to such pollution originates.

CHAIRMAN STEIN: Thank you Mr. Kittrell.

Dr. Hutcheson, do you have any questions?

DR. HUTCHESON: No questions.

CHAIRMAN STEIN: No comment?

DR. HUTCHESON: At the proper time, I want to make a statement.

CHAIRMAN STEIN: Mr. Walker.

MR. WALKER: I think Mr. Kittrell has pretty well given an outline of the Virginia Water Control Board's activities in this. I would like to make these offhand comments.

Our Board has been quite aware of this situation since it came into being. The effective date of our Water Control Board was July 1, 1946. We have been working with the Company, first Mathieson Alkali and later Olin Mathieson, since that time. In the early stages of this problem, it seemed to us that the Company was not fully recognizing the damage that it was causing, and except to the extent that much was done by the Company to prevent these break-outs and flooding and fish kills at that time, it didn't seem to us that they were doing as much as they should be doing.

We held an informal hearing down in that area, in Abingdon, in August, 1953, for the purpose of giving people who were complaining about it, including the people of Tennessee, an opportunity to be heard.

Following that time, the Board, in an effort to determine decisively the damages occurring to the stream, at considerable expense to itself, employed Dr. Ruth Patrick to make a detailed analysis, biological

and otherwise, of the stream, which was done. That was done the summer of 1954. Just prior to that time, we called a formal hearing to determine whether an order should be issued against others to state this pollution in November, 1953, but without information that we felt then was necessary, which came in the Patrick report later, action was deferred. After that report was available, we discussed it in quite some detail with the management of Mathieson, who at that time seemed to us to be much more cooperative than it had been.

We held another part of that hearing in May, 1956, and following that in June, 1956, with the order to which Mr. Kittrell has referred.

Now, much has been done, I think, to stabilize the flow and diminish the effluent in low water periods, so I think your maximum concentrations are greatly improved from what they were during the years 1952 and 1956, which is the basis of Mr. Kittrell's report However, I don't feel there is anything to indicate that the aggregate amount of these mineral wastes have been reduced.

Now, in that order, that we issued in the two parts, the one to bring down the maximum parts dealing with these chlorides, we feel, has been fully complied with. The Company has had outside engineers employed, who have given a great deal of thought and study to it. The other part of the order, which directed the Company to furnish us with information to show that it would not be possible to provide some reductions, or by some means these wastes, has certainly largely been complied with, but I think that yet there can be found some means of reducing such wastes.

Now, under our law, we are required in our orders to issue orders that are reasonable and practicable. I am perfectly frank to say that the position of our Board at this time is that we do not know of any order short of shutting down the plant that would give such a degree of reduction as would be essential to relieve these objections that are perfectly valid that people have there.

We are faced today in Virginia -- and I can assure you that we have been very conscious of this thing and worked hard on it -- we are faced today in Virginia immediately with the fact that we do not know of any order that we could issue that would be reasonable that would make such a material reduction as would be desirable.

I hope the U. S Public Health Service will be able to come up with something we haven't been able to do. Our Board will continue to do everything we know to bring about improvement of this condition. I don't know that we could do any more. We will do that regardless of what the Health Service does, or anybody else does.

If there are technical points about it, what Virginia has done, is doing, or may do, or details of it that you would like to have, we have here Mr. Paessler, our Executive Secretary, and Mr. Otis and Mr. Davis, our technical staff, who are available for information that you might desire.

CHAIRMAN STEIN: Thank you, Mr. Walker, for a very complete statement.

I think if we do not have any more comments from the conferees now, or questions -- both states will be given an opportunity to present statements -- I think we might consider then a brief recess.

DR. HUTCHESON: Before you do that, Mr. Chairman, I am not familiar with the procedure or the way it is to be handled, but I have some comments to make, and I think I might make them now and save a little time, and then we may have the recess.

CHAIRMAN STEIN: All right, sir.

DR. HUTCHESON: First, let me say a word or two about the philosophy of the Tennessee Stream Pollution Control Board.

Mr. S. L. Jones, who is the Technical Director - Secretary of this Board, and Chief Engineer, is with us, and will comment, I presume, on the technical aspect. That is not in my field.

The Tennessee Stream Pollution Control Board recognizes that living as we do in this industrial and mechanistic jumble, that the streams, rivers and lakes are the only means of carrying off waste materials.

We recognize too that we can't have our cake and eat it both at the same time; that these wastes that come from industries must be taken care of by these streams and, therefore, it is not possible to reach a state of purity that some of the groups in the country would desire. We need the industry. Modern civilization cannot exist without it. Therefore, we approach this situation from a similar direction as that used in the State of Virginia, and that is that each industry must be required to produce to the extent possible reasonable and necessary corrective measures to make these waters usable for as many purposes as is possible.

Now, as I understand it, Mr. Stein, we have met here today, not as a court of law, but as a group of reasonable individuals trying to arrive at some kind of a partial solution, at least, to these troubles that are plaguing people of Virginia and Tennessee.

Operating as we do in this country, Tennessee and Virginia, two sovereign bodies, are prohibited by the Constitution of this nation from entering into an agreement one with the other, except as specifically authorized by the Congress, and in this particular instance, we have not chosen to take advantage of the one authorization that was available to us, and that is the joining of a compact that has been provided for.

In the absence of that, the Tennessee Stream Pollution Control Board felt it necessary to make an appeal to the one agency that has some jurisdiction, and that is the U. S. Public Health Service, to bring

both Tennessee and Virginia into a legal association, where we could discuss this problem completely.

As I understand it, Mr. Stein, that is the reason that we are here today. In your quotations from some one of the legal decisions made awhile ago, I was interested to note that it stated there should be a cooperative study and mutual concession of these official state agencies. The jurist that wrote that opinion, I think, left out the most important segment of this, and that is, the industry that is involved. Mr. Block, who is here today, representing Olin Mathieson, and I have had a discussion regarding this problem. I told him I would appear at this meeting figuratively, at least, and actually, if he chose, to hold his hand, and state to the group that he had promised us his fullest cooperation in every effort that we could make toward the correction of this, and that they would use any reasonable and practicable method that could be proposed to them; that he at this time knew of no method that would reduce the pollution that was going into this stream, and that there would never be a solution devised.

I can't accept the latter, because we don't know what will be done in the future. I believe that we as individual members of the Board, and as official board agencies of the separate states, are obligated by whatever means is possible, to start a study and, if necessary, to ask the Public Health Service to enter into research with industry in an attempt to find some means of desalinizing this water, which will be practical and which will not destroy the industry.

I don't mind stating personally here that there is no disposition on the part of Tennessee to destroy the industry. On the contrary, we want to preserve the industry. I think that industry has not done all it can. I think there are few times in the history of any individual, or collective group of individuals, where we do the best we can without some severe stimulation, and I think that Mr. Block's company will be willing to go with us in attempting to lower that amount

of polluting material, which is largely inorganic, which makes it, of course, very difficult, but to lower that to a more desirable limit. We shall never get rid of it.

The difficulty, as I see it, Mr. Kittrell, is that we are dealing largely with a vicious cycle here insofar as the public health is concerned. I am not prepared this morning to go into a discussion of the harmful effects that the sodium ions released from this industry will have on the health of man. We know that he should hold it to a minimum, but it is not just the sodium part being released from Olin Mathieson that is creating the problem, but as you have pointed out in your somewhat detailed presentation, that in some of these cities, it is necessary to soften this water because of the calcium hardness that may be in the water. They are adding additional sodium through the use of soaps, which, of course, are sodium and potassium salts of the fatty acids, and other sodium weight is being added to this water. That is true also in softening and in the processes used in some of these smaller plants.

And so, we come to the point where, because of the extremely heavy load, we are required to add to it in order to get some of the other objectionable materials out. Those things are chemical problems and must be solved by chemists and not the representatives of our two boards that are represented here by Mr. Walker and by myself.

I think, Dr. Aufranc, that you and the agency which you represent, could well spend some time and some money, which is available to the Public Health Service through its research division, in doing some research on this. While I know that some governmental agencies are working on it, others could very well get into it, because they might find a solution that isn't found by others, and in solving this problem, it would solve many throughout the country, or in partially solving it, it would solve many, including, of course, the problem of supplying suitable water to the ships

of our Navy.

We are here today -- and this is the point I want to make -- with industry, not just the two official boards and the U. S. Public Health Service, but with industry, which is represented by Olin Mathieson, although they are the ones with us in this -- in an attempt to work out cooperatively and with mutual concessions, and concessions are going to have to be made at this time -- to provide water for the people that live downstream from that plant that is more nearly suitable to their use than the water that we have today. How it will be done is another problem.

In the more severe application of it, of course, there can be an improvement in the release of these materials.

Just one other thing, Mr. Kittrell, in your presentation I would like to bring out; you referred in some of your charts, and I got lost before you finished, in some of your charts you referred somewhat in detail to the number of pounds of waste that appears at certain locations downstream, which, while it is important, should be related, I think, if you didn't do it, more accurately to the factor of dilution rather than pounds, because it is the amount per million parts of water that we are interested in more than the actual number of pounds that may exist in a river of variable size.

MR. KITTRELL: This has been done on these three charts with the per cent from Olin Mathieson.

DR. HUTCHESON: That must be where I got lost.

Mr. Chairman, I think that is about all that I have to say at this particular time.

MR. BLOCK: Mr. Chairman, my name is Block, of Olin Mathieson. I would like to make a statement

at some time during this meeting, whenever the time is appropriate.

CHAIRMAN STEIN: Oh, yes.

I think it is more expeditious if you will make your statement when called upon rather than now, because Virginia will be in a position to call on you. As I indicated, this is a conference bringing us all together, and I fully subscribe to what Dr. Hutcheson says. However, we are proceeding under this law, under the law, and the procedure is that the Public Health Service is authorized to invite states, and the states call upon the participants from the states. Therefore, in the procedure, first we call on Tennessee and then Virginia. I assume that Virginia will call on industry.

I think it has been proved in the past that this is the best way of proceeding with it.

Now, before we recess for ten minutes, I would like to ask those people who have not signed the register outside to sign the register.

And, Mr. Kittrell, I would like to ask you one question. As I understand it, from your report, the best material for reducing this hardness is the soda ash produced by the plants upstream.

MR. KITTRELL: That is what is used in treatment of water, the hardness.

CHAIRMAN STEIN: I hope this isn't a vicious cycle; whenever the wastes from a soda ash plant go downstream, the downstream water users must buy soda ash to treat the hardness caused by the plant -- or else they must find their water somewhere else.

We will recess for ten minutes. Let's try to get back on time.

(Short recess was taken at this time.)

CHAIRMAN STEIN: I would like to call on the State of Tennessee at this time for any further statements they wish to make, and to call on the people that the state has invited to participate in the conference. Dr. Hutcheson --

DR. HUTCHESON: Mr. Chairman, Mr. Jones has the list, and if he will just call on those present as indicated, I think it will facilitate the meeting.

CHAIRMAN STEIN: Mr Jones.

MR. JONES: We have invited everyone in the Holston basin that would have an interest. These are listed in no particular order of need or anything else. We have listed first the Tennessee Game and Fish Commission, and I know Mr. Fred Stanberry is here, and also two of his Game and Fish officers.

MR. STANBERRY: We don't have anything to say at this time.

MR. JONES: The State Planning Commission is represented by Mr. Bill Starnes out of the Johnson City office, I believe.

MR. STARNES: I am Bill Starnes, Chief Area Planner for the Upper East Tennessee Office for Tennessee State Planning Commission.

Mr. Chairman, Mrs. Smith, and gentlemen, our office primarily is concerned with the development of cities, and even counties in the upper East Tennessee area. That does not exclude the remaining portions of Tennessee, which have regional offices, because we are concerned with their development also. Primarily, the section along Holston River, we offer service to the areas down below Rogersville, Tennessee.

Now, I might also add that there are planning regions which are controlled by local planning commissions, extending from Kingsport down approximately four miles below the town of Rogersville. I stated

that we are interested primarily in the development of these various communities and counties, in that industry is a very vital factor in economy of any community. If you include agriculture as an industry, then industry as a whole is a very large contributing factor to economy of any area.

In working out certain plans for the development of this particular area extending down toward Rogersville, we learned that there were plans by the Tennessee State Highway Department to relocate U. S. Highway 11-W, which was also State Route 1. The highway begins in the City of Bristol and has been relocated as a four-lane road into the City of Kingsport, and I understand that is being worked toward the river at this time. Plans by the State Highway Department are to pick that road up and extend it down toward Knoxville.

Now, on the existing plans of the State Highway Department, this relocation was shown more to the north of the existing road. Our office spent some time and met with various individuals, including representatives of the American Saint Gobain Glass Company, in devising a plan whereby the road could more economically and more feasibly be located south of where the existing road is.

Now, there are a number of implications as to locating it north or south. If you locate it to the north, you serve traffic, and that is about it. If it is located to the south of the existing road, and which incidentally cuts through a portion of the property of Holston Ordnance Works, it opens up a very large portion of property, not only for residential purposes, but primarily for industrial purposes.

We firmly believe in our office that American Saint Gobain is not the last industry to locate down at Greenland, or for that matter, to other portions along the Holston River. We anticipate there will be certain satellite industries, and industries which,

although they may not be compatible, they will be dependent upon one another. If, for instance, only American Saint Gobain is located down at Greenland, employing goodness knows how many people -- they won't tell us for sure -- those people have to live somewhere, and because of that there will be homes constructed. Any time you have homes constructed, you will also have related business houses to serve both the industry and these people. This will entail by necessity the providing of certain functions which are of a governmental nature, either city or county.

Now, Church Hill, in anticipating certain growth, is already beginning to study the possibility of a sewerage system and a sewage treatment plant. They anticipate that the growth around Church Hill will create so much sewerage there will be a possibility of this sewage, even if it were by septic tanks, being dumped into the river, and they do not want to contribute to that, so they are investigating control measures. So, at least Church Hill will not be increasing the pollution.

On the basis that American Saint Gobain will not be the only industry, then the State Planning Commission, by necessity, is greatly concerned as to the pollution of the stream reducing the potential growth of Hawkins County, and also Kingsport.

This leaves the door open for our Knoxville office to be concerned from Rogersville on down. They will take it up here.

Thank you.

CHAIRMAN STEIN: Are there any questions or comments?

(No response.)

CHAIRMAN STEIN: Thank you, Mr. Starnes.

Mr. Jones --

MR. JONES: I am not sure whether there is a representative from the Tennessee Department of Conservation and Commerce Division here or not.

MR. SHOWALTER: I am Mr. Showalter. I have no particular statement.

MR. JONES: T. V. A. is located in that area. Mr. Churchill, do you have a statement?

MR. CHURCHILL: No statement.

MR. JONES: Tennessee Conservation League, I believe, is represented by Mr. Mayland Muse.

MR. MUSE: They gave me a statement. I will not take up too much time. I will read it to you and then turn it over to this lady, file it with you. It won't take but a minute. There is only one page.

"I am Mayland H. Muse, Chairman, Pollution Committee, of the Tennessee Conservation League, an independent organization of people who are interested in the whole conservation program. Our special interest lies in the field of outdoor recreational programs. The League is supported by approximately 130 sportsman's clubs, boating clubs, watershed associations, garden clubs, humane societies, etc. It is the largest state-wide organization of sportsmen in the state and claims to represent the approximately 700,000 license buyers (hunting and fishing) in the state.

"Our interest in the watershed and water pollution program goes back since the inception of the organization in 1947. During our 14 years existence we have taken repeated stands on this subject. As late as the 1960 Convention in March of this year, the League restated their statement of policy on this subject. This statement we would like to insert at this point.

"The TENNESSEE CONSERVATION LEAGUE asserts the principle that the producer of contaminating wastes, whether citizen, industry, or municipality, has a social responsibility and moral obligation voluntarily to prevent the pollution of public waters. At the same time, we recognize that regulations and enforcement are necessary to restore and to preserve clean waters. In keeping with the aforesaid principle, and in recognition of growing water shortages and/or the seriousness of the pollution menace of public health and welfare, the TENNESSEE CONSERVATION LEAGUE declares the following policies and objectives in water pollution control:

"1. Sound and effective pollution control laws and programs.

"2. Adequate federal authority to clean up pollution in interstate waters in cases where the states, interstate or private agencies cannot or will not do the job.

"3. Adequate sewage treatment facilities in every community; adequate waste prevention or waste treatment by every industry.

"4. Adequate research by public and private agencies aimed at improving the inefficiency of sewage treatment and of solving difficult problems of industrial waste control.

"In the interest of the farming interests, the recreational interests, and all others who depend upon water usage in the South Holston watershed area, we urge that all necessary steps be taken to prevent further pollution and to reduce existing pollution in the watershed area.

"Respectfully submitted.

"TENNESSEE CONSERVATION LEAGUE."

CHAIRMAN STEIN: Any questions or comments?

(No response.)

CHAIRMAN STEIN: Thank you.

MR. JONES: Mr. A. B. Coleman, of the Kingsport Chamber of Commerce, has requested to be permitted to make a statement.

MR. COLEMAN: Mr. Chairman, and Mrs. Smith, I am A. B. Coleman, Executive Vice-President of the Chamber of Commerce. We had this brought home to us pretty forcibly to the effect that North Fork water is not suitable for many industries and would like to see some solution made which would encourage new industry without damaging certainly any that we already have, because our primary responsibility is to people in the area who are already providing employment.

I would like to present this map.

In negotiating, a committee of six or eight of us negotiated with the American Saint Gobain in competition with twenty-five cities in the United States, and we developed all of these sites, engineering information, in development of them, and in so doing, we discovered how limited we are in East Tennessee around Kingsport with land level enough and still high enough for large industry. So based on this information we produced, the American Saint Gobain finally located here, and another one of our large industries has acquired another one that we were able to get under our wing, and those two are set.

There is more land available here, but there are also a number of other locations which we have developed since that are not on this map, along 11-W, Southern Railway and Holston River along here (indicating on map), but if you get east or south of Kingsport, there is very little level land left. We have this out here which is extremely rough. So, most

of our future potential is between here and Greenland, fourteen miles. Greenland is fourteen miles away, and most of the potential growth for industrial property is west of Kingsport.

Now, one of the first sites that was most desirable for large industry is what we call Frisco, where we have two locations, and that would require use of water from North Fork, and the water was not suitable, and was one of the factors in this industry deciding on a different location. We were just fortunate enough that this particular industry, there were things wrong with other towns too, so that they didn't get too far away, but one of the things we investigated was the possibility of bringing South Fork water out to Frisco, which would have cost for this particular industry $400,000 in capital. Our potential lies in this direction.

Certainly our Chamber of Commerce would like to see this problem met in such a way that would encourage the use of this land as industrial land without unduly penalizing any of our present industries, either those in our own state, or those above us who are contributing to our economy, because they are in our general trade area and our general economic area.

CHAIRMAN STEIN: Thank you.

Any questions?

(No response.)

CHAIRMAN STEIN: Thank you, Mr. Coleman.

MR. JONES: Mr. Marsh, the City Manager of Kingsport, is here.

MR. MARSH: Mr. Chairman, Mr. Jones, our City Board, the Board of Mayor and Aldermen, asked me to appear before your group and to let you know of their interest in this matter. They are interested in the stream pollution abatement, and I would

like to give you just a little background on that.

As an example, twenty-five years ago when I came to Kingsport, we had 3,200 water meters or customers, and today we have 11,450, with a fast continuous growth. In addition, we have seven water utility districts that have grown up around us.

Our problem, as Mr. Kittrell has brought out, in the 20's when we constructed the plant, it was our desire to go to the North Fork, but the pollution prevented that. Today, we are supplying one of these utility districts completely. A few other districts come to us in times of low water in their supply. So, it seems to us that with the limited supply and the outgrowth of each of these utility districts of their available supply, we face the prospects of eventually feeding all of the water to the utility districts in this area.

With that in mind, and with our competing with out major industries for supply of water that is allowed to be released for any given time from the Fort Patrick Henry T.V.A. lake or dam, at times is rather rugged. We anticipate, and we think in the future the City of Kingsport for its additional supply must go to the North Fork, and in so doing, it is vital to us that this be cleaned up so we can have an adequate water supply in the future. We do not know whether this pattern of growth will continue, but obviously today we are supplying water to about 50,000 people. With the utility districts in our immediate area, they are supplying water to about 30,000 additional, so that growth has been in the past 25 years. What the next 25 years will bring, we certainly anticipate with the outlook in this area we will need additional water. We are now supplying almost ten times the amount monthly that we did 25 years ago. In fact, each water consumer today uses a great deal more water than he did just a few years ago. With that in mind, the City of Kingsport would certainly hope that this stream could be cleared for possible future use as municipal

supply.

CHAIRMAN STEIN: Thank you.

Any comment or questions?

(No response.)

CHAIRMAN STEIN: Not as a comment or question, but just a look at the map and review of what Mr. Kittrell says, it indicates that we have a situation here that is becoming more prevalent throughout the country. What we have is a system of regulated streams. For the foreseeable future, of course, we don't have the people here who are responsible for the flow. If there is anything like the other areas where we have regulated streams, I imagine that this is about as much water as you are going to get now over the future. There is no big demand that is going to come. Therefore, if we are going to go in an area with regulated streams, it becomes more and more important that every bit is available so we can make the maximum use of it to serve a multiplicity of uses. This is one of the fundamental problems facing the small areas of the country. This is not unique. I think this is the prime reason we are here, because we recognize these problems of industrial and municipal growth in the area, and the recognition also at a particular time that you don't have an unlimited amount of water available.

MR. CHAPMAN: What is the source of water for the surrounding water utilities?

MR. MARSH: It varies greatly. Some of them have springs. I think, almost without exception, it is a spring proposition.

Mr. Coleman, do you know of one that is now in a filtering plant in our surroundings? It is either wells or springs.

MR. CHURCHILL: I am M. A. Churchill with T.V.A.

I would like to clarify a point here on this water supply situation in Kingsport.

The South Fork of Holston is currently used by the Kingsport Water Plant. It is a much larger stream than the North Fork and T.V.A. will certainly do all it can to cooperate with Kingsport. As it grows and needs more water, T.V.A. will see to it that it gets the water it needs. I wouldn't want anybody to think that T.V.A. is holding out the water to slow up development of Kingsport. That certainly is not true.

MR. JONES: I believe our representative from Holston Ordnance Works is here.

MAJOR VALENZUELA: We have no statement.

MR. MUSE: Mr. Jones, since the Kingsport Chamber of Commerce is here, you sent an invitation to the Johnson City Chamber of Commerce and they called me and asked me to represent them and to cooperate with the Kingsport group. I just wanted that on the record.

MR. JONES: Thank you.

I believe Mr. Smith is here from the American Saint Gobain Corporation.

MR. SMITH: I don't believe we have anything to add at this time that you don't already have.

MR. JONES: Is there a representative from Rogersville or Hawkins County?

(No response.)

MR. JONES: Is there any from Morristown?

MR. SEVERS: I am from Morristown. We have no comment at this time.

MR. JONES: Dr. Erwin from the Sullivan County

Health Department is here.

DR. ERWIN: Thank you for calling upon me. I had no idea of making any comments, but since you have, it would offer me an opportunity to impress upon you what perhaps has already been covered by Mr. Stein, the problem that our whole nation, as well as our home area, is coming to as a result of increase of our population. The more people you have, the more things to do for them, and the more things to do it with. This thing of water is getting to be a very vital thing for municipal and industrial use.

Whether or not industry wants to accept it now or later, and in more quickly drastic terms, it seems to me that everybody concerned is going to have to compromise as has been pointed out here and start considerabout more research to try to meet our water needs in the future.

This thing of chemicals going into thewater that we don't know too much about, that may have some bearing on people's health, certainly is something that ought to be learned more about. Water is very vital and is going to become shorter in our country, and may have, as somebody pointed out, to be piped in from the ocean some day by large viaducts and conduits, and treated, and take all that stuff out. Maybe that will be the answer to what we have got here.

To identify myself, I am Dr. J. W, Erwin of the Sullivan County Health Department, representing from a medical standpoint Bristol, Tennessee, and Kingsport.

CHAIRMAN STEIN: Thank you.

MR. JONES: And from Knoxville we have Mr. E. D. Hawkins and Mr. John Quinn from the Knoxville Utilities Board.

MR. QUINN: I am John J. Quinn, Chemist with the Knoxville Utilities Board.

My statement will be more or less repetitious of what Mr. Kittrell has said. We have been cognizant of the effect of the Saltville waste and the disaster that occurred there on Christmas Eve of 1924. Since then we have run daily determinations on chlorides of the plant. These wastes do not cause any operational difficulty at the water plant. The effect has been more on the characteristics of the water from the standpoint of hardness and chlorides going through to our customers.

Our records show the yearly average of chlorides in the Knoxville water of around forty parts per million. And we found that the sum of the chlorides and the alkalinity of raw water come pretty close to that of the hardness, indicating that the chlorides are producing a hardness in the water. With an average hardness of 106 parts per million, elimination of the waste would lower the hardness of the water at least about 25 per cent. We have had our reading of 148 parts per million chloride, in relation to upstream T.V.A. lake, and previous to that we had as much as 170 parts per million chlorides in the water.

As said before, the high chloride content is damaging the products of one of our plants producing brass, and also damage to a mirror plating concern to the extent that they had to put in ion exchange equipment.

We figure conservatively that these wastes have cost the householders of Knoxville in the excess of one hundred thousand dollars per year for extra soap and detergents. The estimated cost of softening for industrial plants has been placed at something near $100,000 per year. For example, one laundry spends about $550 a year on salt. Another industrial plant spends $1,600 a year on chemicals.

MR. JONES: Thank you.

We may have another representative from

Knoxville. There is a Northeast Knox Utility District Water Supply at the Knoxville area. Are they here? Or the East Knox Utility District, which is also in Knoxville, or Knox County? And Jefferson City, which is also located on the Holston River? We invited them.

Unless I have fouled up my list, I think this includes everyone that is involved on the Holston River.

CHAIRMAN STEIN: Do you have anything further to say before we go to Virginia?

DR. HUTCHESON: Before you leave Tennessee, Mr. Chairman, it has been called to my attention that my previous statement, which was not written out, but given off the cuff, was not complete, and for the record I would like to add this phraseology.

In my previous statement in reference to research by the U. S. Public Health Service, I did not make it clear that we believe that industry has a primary responsibility in the field of research directed specifically to the problem for which a particular industry is responsible. I simply assumed that was understood. I put it in the record for what it is worth, believing also that industry recognizes that, as has been demonstrated in Tennessee, at least, over and over again.

CHAIRMAN STEIN: I might say that we recently held a meeting of the Federal Water Pollution Control Advisory Board of the members appointed by the President, and the representatives of industry on the board made that position very clear to us in the past two or three weeks.

Mr. Walker, would you like to call on Virginia again?

MR. WALKER: We are not acquainted here and there are a number of people who are undoubtedly concerned about the Holston River in Virginia. We made

available to you all [illegible] records, which in the numerous times we have had, which, I think, pretty well show the objections and complaints in that area. We have invited here representatives of the Olin Mathieson Chemical Corporation, and we would be glad to hear them at this time. Mr. Block --

MR. BLOCK: My name is Edward Block; Senior Vice-President of the Olin Mathieson Chemical Corporation, in charge of chemical operations.

I think the primary question here today is, are we good tenants of this river basin? I would like to submit that we are good tenants of this river basin. We have been located at Saltville for about seventy years. We ship out of Saltville a little less than two thousand tons of freight a day, which causes the railroads to be highly prosperous because of that freight, and all of the attendant benefits thereto.

We have about 1,200 employees. We calculate that five thousand families are dependent on our operation through the correlary activities. The next number of people, if you want to multiply by four, that would be 20,000 people dependent on our activity. We have a payroll of about six or seven million dollars a year.

Just six months ago, or about that time, the U. S. Air Force came to us and said -- we didn't go to the U. S. Air Force, they came to us -- they said, "We need a hydrazine plant, and we need it in a hurry." We negotiated with the U. S. Air Force and we offered them several alternates as to location. We offered them Joliet, Illinois; we offered them Niagara Falls, New York; we offered them Saltville, Virginia; as being all the locations for Olin Mathieson to make hydrazine. The U.S. Air Force concurred with us that the best place for Olin Mathieson to make hydrazine would be Saltville, Virginia.

At the present moment we have five hundred to six hundred construction workers engaged in building of this hydrazine plant at Saltville. The cost of the

plant will exceed fifteen million dollars. The employment, exactly, I must not disclose.

The fact of the matter is, Saltville is a good location for chemical activity. Saltville is a good location to engage in industry. Saltville is a good thing for the river basin. It is a good thing for Virginia. It is a good thing for Tennessee. One of the largest suppliers for steel for this new hydrazine plant is a fabrication plant here in Bristol, Tennessee. Tennessee benefits from all these things as well as Virginia.

I think Mr. Kittrell should be requested to bring his data more up to date. He gave us data from 1952 to 1956. I don't think that is proper. I think Mr. Kittrell should have given data for 1957, 1958 and 1959. I think this group of ours will submit that we have made improvements of material nature in the period of '57, '58, to '59.

As Mr. Walker has stated, we both worked very closely in the recent years with the Virginia Water Board, attempting to the best of our ability to satisfy all the requirements of the Virginia Water Board's wishes. We have hired engineers to help us in this problem we have, and we employed Charles T. Main Organization of Boston, and we have in our employ Harvey Engineering Company of Chicago, both experts in fields of control of effluent, how to handle effluent; how to dam it up; how to dispose of it, and so forth.

I think I ought to outline to you the processes of it and why we are in Saltville. We make soda ash at Saltville. It is an inherent characteristic that a soda ash plant can only be located where there is a good grade of limestone and where there is a good grade of salt. You cannot locate a soda ash plant if those two conditions are not complied with. I cannot locate, for example, a soda ash plant in the City of St. Louis; it can't be done, because those conditions can't be complied with. If I want to locate a new soda ash

plant, I must find a spot in the United States where I can comply with those two conditions.

Those two conditions were found to exist in Saltville some seventy years ago and a plant was commenced at Saltville, and we operate that plant in a reasonably efficient way.

There are approximately nine or ten plants making Soda Ash in the United States. They all make Soda Ash by the process called ammonia-soda process, a process that was developed in Belgium maybe ninety years ago. That process has been improved on from time to time, but it is the same process basically as it was when it was first developed. That is the only process used in this country for producing chemical Soda Ash. It is the only process used throughout the world for producing chemical Soda Ash.

Now, as a result of that manufacturing, there is a certain element. It is true that in years gone by when people weren't as conscious as they are today of pollution, we were careless. We will admit it. It is also true in the years gone by we have learned lessons just as you have learned lessons. We have improved our process, we have restricted our outflow. We are doing our best. We are constantly tightening up our process.

We hope for improvements in the future. We hope to better things, but there will always be a certain amount of outflow inherent in this process. There is no good satisfactory way to discharge this effluent. We can't put it out in the sky. It won't go under ground. It has to be done by stream. This is the thing that all of the Soda Ash plants in the United States do. It is the thing all the Soda Ash plants in the world do.

Eventually, the public of the United States is going to have to decide whether they can make Soda Ash by this process or whether they are going to have to go to a process that costs much more

money. That is up to the public. We will not fight the public on a public decision. We will do our best and ultimately the public decision may maintain and recognize it, but in that interim we will do our best. And we think we are entitled to ask the public to bear with us in that interim.

Other Soda Ash plants are confronted with the same problem. We all have the identical problem that is inherent, and until then, and when a better process is developed at the right cost price, we will have to go along in this manner.

Our investments in Saltville are large. The community is completely dependent upon us, and if by some reason our operation was extinguished, you must assume that all of these people, whom I mentioned previously, will be extinguished, and their investments with us. So, you would not alone be extinguishing us. We would accept that decision if that is the decision of the public. Remember, in affecting us, you affect a correlary number of people who have a far greater total investment than we do, as is characteristic of all manufacturers.

There was a statement made that certain industries were lost to this area. I think that statement is over exaggerated. Every inquiry of a corporation that wishes to locate doesn't mean they are ready to locate. We just located a new plant at Charleston, and we picked Charleston after we rejected about twenty other locations. The same is true in Tennessee. If you have twenty locations, twenty inquiries doesn't mean that you are going to get twenty plants, and the Chamber of Commerce knows that. The Chamber of Commerce knows that if you get twenty inquiries, you are going to be lucky if you get one, and then you are lucky if that one comes in with some money.

Now, you talk about pollution. We have a contamination, I prefer to call it, we have it and can't avoid it. But a salami factory has a contamination too. Some people like that odor and some people don't.

Some would go along with it, and some would hate it. There are things in this complicated life that we have to learn to tolerate.

Let's look at another point of view. For the benefit of the area, for the benefit of Tennessee, we produce soda ash at Saltville. American Saint Gobain is just building a new plant and are going to buy soda ash. The fact we are at Saltville means that all of the people -- and there is a multiplicity other than American Saint Gobain that buy soda ash, a great number of people in this shipment sphere that buys soda ash. If production is discontinued at Saltville, there will be no soda ash in Saltville. The closest other location is in the Cleveland area, and the freight from the Cleveland area would have to be paid by the people that are located in this area, and I can assure you that any other industries that consider locating in this area will have to consider the tremendous amount of freight that will have to be paid on t h at soda ash from Cleveland as against the small amount of freight that has to be paid from Saltville.

So, remember, from these detriments there are also benefits. We say that we benefit this area materially. We know we benefit this area materially. We are amenable and glad to work with the people here, the people in this river basin, to the best of our ability. Beyond that, I am sure you won't ask us to go.

There was a suggestion made -- I believe Dr. Hutcheson made it -- that we work together. Olin Mathieson would be more than pleased to work with a joint group of Tennessee Water Board and the Virginia Water Board toward the best solution, toward the minimizing of this problem, a nd will commit ourselves to that, but bear in mind, when you bring industry to a particular area, you can't have all the benefits; you have to take some of the detriments that come with it. I don't know of a single factory that doesn't along with its benefits bring detriments when they come.

Thank you.

CHAIRMAN STEIN: May I ask you a question or two?

MR. BLOCK: Certainly.

CHAIRMAN STEIN: I think we are faced with the problem that we have here, and I think in a large measure, most of us agree for the most part. However, we have a law which provides that if remedial action is not taken to abate pollution -- I think we do have certain complaints from both states about pollution of the water, so it is reasonable to assume that pollution exists -- our action reasonably calculated to secure abatement of the pollution now existing, certain eventualities happen under our law. Now, the question we are faced with is this. We have a plant that came here many, many years ago, and very few people thinking about this problem, and it went into a particular location. The process by which the plant is operating is materially the same as when it came. And while considerable improvements have been made, there are still complaints from various people downstream that the waters are not of a quality which will permit them to be used for legitimate water uses that they would like to make of these waters.

Now, the question we are faced with here, on the basis of this statement, is whether the industry, or we, or the states, are taking action reasonably calculated to abate this pollution.

As you say, and I think our law is pretty clear, further on where it comes to this point -- I think a determination is finally made where due consideration has to be given to the practicability and the physical and economic feasibility or securing abatement of any pollution. I think that is a reasonable provision.

MR. BLOCK: We subscribe to that very thoroughly to the extent of practicability and economic feasibility, we prescribe one hundred per cent.

CHAIRMAN STEIN: But now, if we get to that, here is what I think. I stand with Mr. Walker on that. I am an optimist and I believe we can go farther than we have gone here, and if we stick together, we very well may come up with a solution. I also agree with Dr. Hutcheson, and I think in dealing with the government that the primary responsibility of treating this waste rests with the industry that manufactures the product that makes the waste. This is not a function of government or regulatory agency, and I don't think industry would want it that way.

MR. BLOCK: You must recognize and we must be bound by it, we can only go to the extent of feasibility and economic practicability.

CHAIRMAN STEIN: What the point is, and I think here we get the balance, this is a balance of feasibility and economic practicability, giving due consideration. There is also the requirements of the City of Kingsport, of the people in Tennessee and of the industries in Tennessee that want to go into it. These things have to be balanced.

Now, I don't know that we, anyone here, is qualified to make that judgment. I do think that our law has a procedure, which, if followed, will place the responsibility for making the judgment on certain people, but I don't know that we are faced with that judgment.

What I am pointing out is that, I think the Surgeon General has to come up with a determination, and I hope that the conferees can come up with a determination that actually reasonably calculated will secure abatement of the pollution. Further action than that occurring now may be taken, that we had a course of action leading in that direction -- I think that is --

MR. BLOCK: I think, Mr. Stein, the Surgeon General is bound to make a decision within the confines of what is best for the American people,

considering the public aspects, considering industrial aspects, considering the consequences of those decisions, and if all those factors are taken into account when the Surgeon General makes his decision, based on every aspect being considered, we don't think we are privileged citizens, and are willing to be bound by the things that are proper in humanity.

MR. STEIN: That is correct. I don't think there is any difference here, but I think in relating to specifics, or to a decision, that a state regulatory agency or the Surgeon General has to make, always get bound by one thing, and that is a time schedule to see if this is reasonable in time.

I think Mr. Walker stated that he was optimistic; that we weren't at the end of the road in the improvement of the conditions of the quality of water perhaps caused by effluent from the plant, and I do think in dealing with the factual situation, in dealing with hard physical facts, I don't think there is any disagreement on what the facts should be, what the plant is putting out, and what the conditions of the water are, but you see that there is a possibility of the effluent discharge being changed, some change in operation or whatever the plant may see fit, whereby the conditions of the water as they flow down North Fork of the Holston below Saltville can be improved over what they are now, or how can we move in that direction?

MR. BLOCK: I made the statement that I think Mr. Kittrell's data should be brought up to date. I think the Virginia Water Board should go along with us and state that we have made material improvements. We have projects under consideration to help remove any of the milky character from the river as stated here. We are willing to spend money within the limits of practicability. We are willing to go along as much as we can, but it would be foolish for me to make a rash statement or rash promise. I think that the thing that should be done is what Dr. Hutcheson said, that the Virginia Water Board and Tennessee Water Group and ourselves work together, and we should all be brought to

a point where we all fully understand each other's problems, and work toward a point of minimizing the problem.

After we conclude all that work, which will take some time, and you come to a decision and the public says, this is too great for us to continue to to tolerate, then I think there is another road, but I think you first must go down the road where the Virginia Water Board, Tennessee Water Board, and ourselves may fully get together, fully explore all the aspects, fully understand the problem, and come to an agreement that we have done everything any one of the three of us possibly conceive, and with that result, whatever decision is made, we will have to live by it.

CHAIRMAN STEIN: We are not suggesting this -- I might say, in the other problems we have had, however difficult it looked, we have come up with reasonable solutions.

MR. BLOCK: You must remember you have this identical problem, only worse, in other areas. This is not the only area. If you recognize this as the only area, to that extent you are in error, because as I stated there are nine or ten other plants. We have many times considered whether we should spend additional money and enlarge the Saltville plant, but because of this problem we can't do so, and we would have to look for other locations.

We are now in Saltville a small producer of soda ash as one can possibly and economically be. There are plants that are three times as big as ours. There are plants, many of them, that are twice as big as ours, so the amount of effluent that you tolerate at these other plants is twice as great. We cannot enlarge Saltville. Economically, we should enlarge Saltville, and we should employ more people, but because this problem exists, we cannot do so.

CHAIRMAN STEIN: That, I think, while we recognize that we have a problem in many areas of

the country, such as come from Sulphur or Soda Ash plants, or many other sources of pollution, really devasting areas of the river, I think the way to get at it is to hit one segment of the river at a time. The fact that we may have, and I don't think it is very productive to name specific rivers here, but may have vast pollution problems, then the people in this area -- is not too great a problem to the people in this basin who feel that they should have population and industrial expansion for their proper growth. This is the area here we are dealing with.

MR. BLOCK: There is a grave question that comes up technologically, that maybe you should be advisedly working in other areas, because you may turn up information in other areas that we are not aware of that might be highly beneficial to us. And if you do so, you should turn that information over to us. Up to this moment, we do not know of any information available from other areas that would be helpful to us.

CHAIRMAN STEIN: Let me go over that again. I think we have this problem of the function of a regulatory agency. A regulatory agency is not the instrument charged with the responsibility for coming up with a solution to industrial waste.

MR. BLOCK: You don't mean it is against the law for you to turn that information over to us?

CHAIRMAN STEIN: No, not necessarily. We have a national technical record which, as you know, is a clearing house for industrial waste information. We have worked, and I think we have for every industry, which is to cooperate with us, we keep on a post card arrangement results of research leads in advances in treatment methods of all the industries. We never indulge the source, but we make this available to the industries.

MR. BLOCK: In Chicago, all Chicago water smells like phenol. Are you going to extinguish steel industry in Chicago because of the phenol odor

because your punch card system doesn't work right?

CHAIRMAN STEIN: We are getting off -- you mentioned a name there.

MR. BLOCK: No, we are talking business.

CHAIRMAN STEIN: Let's get back to the facts. Talking about Chicago drinking water, I think it is well recognized in the profession that Chicago drinking water is some of the best drinking water we have.

MR. BLOCK: Not from an odor standpoint.

CHAIRMAN STEIN: Five days of the year you get a phenol smell. Now, the problem is, where we have had other cities, the people are conditioned for a rather inferior water, we don't get the complants. In Chicago where the quality of water is so highly consistent, the phenol complaints come in, we do get a lot of complaints. However, I am not suggesting that Chicago be used as an example. This is why we have this water and this procedure here. In Chicago we have a rather grievous state of affairs.

DR. HUTCHESON: I want to raise a point of order. Personally, I am not interested in Chicago.

CHAIRMAN STEIN: Let me terminate that. They have had a case before the Supreme Court since 1910, which is not solved yet, which has cost the State of Illinois hundreds of thousands of dollars, with no solution. This is what I hope we will avoid.

Are there any other questions?

MR. WALKER: I have no questions, but since you are philosophizing, it seems to me industry has got to solve their problems. We in these public control agencies are incapable of finding these solutions.

I have been in this thing fourteen years simply because of my interest in it. It has taken an awful

lot of my time, and I am interested purely from the standpoint of recognizing the value of water. Now, I have always felt, and I still feel, that industry can find solutions to a lot of these problems. They have done so many things -- I am not a technician, know nothing about technicalities -- but they have done so many things that are perfectly astounding to me, that I believe if industry would put a larger part of the research dollars into the problem of finding ways of avoiding these wastes rather than putting most of the research dollars into finding ways of producing things, that we would be better off. I think in the past industry has completely failed to recognize that. I think they are beginning to recognize it, and I think in the future they are going to have to recognize it, but your vast problem, your whole solution of this problem, final analysis, depends on public opinion. Will public pay a price for products that carries with it the necessity for making it a point to not damage somebody else? That time will come.

I wish we could see a solution here today. I wish we could hope we will see a solution in six months or twelve months. I don't see that, but I am, as I said, optimistic that some day we will find some solution to this, and I think we have got to continue to impress industry to work toward that end. And I think that most industry is quite willing to move more in that direction, which has certainly been my experience here. In the meantime, as far as I can see it from Virginia's standpoint, we are going to keep on your neck and Olin Mathieson just as hard as we can toward finding a solution, and we are going to order you to do anything in the world that we think is reasonable, if you don't do it without an order, but I believe you will do it without an order.

MR. BLOCK: We don't disagree with you one particle, Mr. Walker, in any of your reasoning, and we will go along with you a hundred per cent to the extent of our ability.

DR. ERWIN: I would like to ask Mr. Block one question. He made a comment about the cost of the product to the people, if he had to go into the method of making this, that he wouldn't cause the pollution. Let's assume that if all the soda ash makers in the United States went to the same process -- I admit if he had to, he would have to go out of business, if others didn't have to -- but let's assume that all the soda ash producers in the United States adopted the same policy of making soda ash which would not create this pollution, how much more would it cost the public percentagewise, two times as much, three times as much, twenty per cent, sixty per cent, one hundred per cent?

MR. BLOCK: I think it would double, just as a rough picture.

DR. ERWIN: In other words, it would be a hundred per cent increase in cost?

MR. BLOCK: Yes, sir.

DR. HUTCHESON: Just one statement. I am new at this, as all of you can tell. Mr Stein, in the preamble of his question that he directed to Mr. Block, made some statement about a procedure in which the Surgeon General would reach an opinion.

I would like to express a hope, which I think will be honored, that when the Surgeon General makes his decision, if it comes to this point, that though it may not be required by the federal statute, this decision will be reached only after a conference with the representatives of, designated representatives I should say, of the Stream Pollution Control Boards of the two states involved.

I personally would want to discuss that with him.

CHAIRMAN STEIN: I am sure that he has not made a determination which has not been unanimously recommended in the past by representatives. As a

matter of fact, this is one of the purposes of our meeting here today. We prepare a summary for issuance by the Surgeon General.

I want to make one point in clarification. It looked like we were going far afield. Generally, at least from the government's point of view, we generally do not mention other communities by name. We know that whatever we say here gets picked up in other communities. When this was mentioned, we have, and I say this on the basis of experience, we feel we have an obligation to put something in the record to indicate that; otherwise, if by our silence to save time, we don't, the communities say we are familiar with the situation and should have spoken. I wanted to make that for the purposes of the record.

I think we are faced with a situation here; one, we may have a discussion or summary and get on with this vote. Perhaps, we can begin to summarize first. I think it is pretty evident that the North Fork of the river --

MR. HIGHTOWER: I am C. C. Hightower of Olin Mathieson. For fear that the members of the Board, as well as the attendees, may get a misunderstanding of the Olin Mathieson situation as it now is, we are treating waste, we are retaining waste and discharging it under a controlled procedure. That has not been brought out anywhere here today. We are not just dumping the material as it is produced into the stream. We are making a very sincere effort to both treat and regulate the waste.

CHAIRMAN STEIN: Thank you. I am glad for that emphasis.

Does anyone else want to make a statement before we go on with a possible summary and discussion? If not, I think we can proceed.

Looking at the map of the North Fork of the Holston River, that is an interstate river as defined

by federal law, as it flows across the boundary of two states. All parties here seem to be agreed that pollution from Olin Mathieson Chemical Corporation plant at Saltville enters the North Fork of the Holston River, and these discharges from the plant contain quantities of calcium and sodium chloride. This creates a condition in the water of the river which affects people in Tennessee so as to materially affect the condition of the water, municipal water supplies and numerous industrial uses, and as to cause fish kills, and to cause a murky condition of water, and interferes with agricultural pursuits and the rusting of farm machinery.

Now, I think cognizance should be taken of the efforts of the Virginia Board, and of Olin Mathieson Company, in making efforts to reduce the waste. I think cognizance should be taken of the fact that the public agencies involved here, the state agencies, and the industries, are very aware of the problem and its obligations.

Here is a suggestion that I would like to make. I think se are at a situation here -- industry made a suggestion perhaps that Mr. Kittrell should up-date the data, also made a suggestion that we should get together with the states. I think we might make a suggestion that industry should undertake a vigorous effort to come up with a program for a maximum reduction of the waste loads to reduce the pollution situation and improve the qualities of the river; that this be in close conjunction with both states. You mentioned both states, Mr. Block, and significantly didn't mention Public Health Service. We would be happy to cooperate, if you wish.

MR. BLOCK: Yes.

CHAIRMAN STEIN: This is fine. We have no objection to the procedure. I wouldn't say just because someone worked for the federal government he doesn't face it too.

MR. BLOCK: You are from Washington, D. C.

CHAIRMAN STEIN: I would suggest that the conferees meet not later than one year from now in order to, one, determine the progress being made, and two, to see if we all agree on the situation.

I would also suggest at that time that we might ask that the Olin Mathieson Company give, if they will agree to this, give a fairly definitive report of their position, what they have done during the year, and a prognosis of what we could look forward to, in corrective action. I think at the end of that time, the conferees can possibly come to a determination whether we can consider, at least from the point of view of the recommendation from the conferees, if adequate action reasonably calculated to abate the pollution is being taken in the light of all the circumstances, or not; at that time, I think we can make a recommendation to the Surgeon General. And, of course, the Surgeon General, I am sure -- and again, talking about the Washington bureaucracy -- the Surgeon General's term runs out, we can't speak for the next one, but it may be the same. I am sure the Surgeon General would be happy to discuss with the state bureaucrat agencies involved.

I don't know if that is a reasonable suggestion to the conferees, or whether that should be modified in any way. I am open for suggestions.

DR. HUTCHESON: I would like to make the suggestion to add to yours, the Surgeon General -- I think I know what the answer is -- ask the question, has the National Technical Task Committee of his office or the Service considered treatment or reduction of this type of waste, and if that answer is no, that he be requested to consider directing that they do so.

Do you know whether it is being done or not?

CHAIRMAN STEIN: I would like to check with the technical staff. To my knowledge, I have no indication of any activity in this area. Do any of you?

MR. CHAPMAN: I don't think there is in this

specific area, I don't think so.

CHAIRMAN STEIN: I think the answer is negative, no.

DR. HUTCHESON: If the answer is negative, I think that we should give serious consideration to directing this task committee to begin working in this field, because it is a field that is going to become more and more important in a number of areas in this country.

CHAIRMAN STEIN: Do you have any comment, Mr. Walker, on that suggestion?

MR. WALKER: I don't think it has much value because it is inconceivable to me that the U. S. Public Health Service can have the kind of technicians it is going to require to find a solution.

DR. HUTCHESON: They can get them.

CHAIRMAN STEIN: Let me clarify this. As I understand this National Technical Task Committee -- and you very well, Mr. Block, may have more information on this industry than certainly the people we have employed today -- as I understand it, what we are trying to do is get together with a group of the industry. Unless the industry is fully cooperative, we can't even start the program. That means a usual submission of data, and so forth and so on. I don't know that that has been done with the soda ash group. It may or may not.

Now, in addition to that, I think what has happened, and this goes both ways, we try to keep abreast and keep everyone abreast of the research done in various parts of the country and in the plan in meeting the problem. If a problem should reach such national importance, and if we have the proper people available, and the money available, of course, perhaps a Public Health Service person would aid in this. I would think half the experience of the

great advances in the industrial waste treatment has come from the industry. It doesn't come from the Service. Our function, generally speaking, is to deal with public agencies or with basic research.

MR. BLOCK: I didn't understand Dr. Hutcheson's question. Did he mean to encompass all soda ash producers in this situation?

DR. HUTCHESON: Yes, in this type of waste, from all producers.

CHAIRMAN STEIN: For clarification again, I think if we did this through the National Technical Task Committee, by necessity, we would probably approach all producers.

MR. BLOCK: I must subscribe to Dr. Hutcheson's suggestion that all producers correlating all technical information could be much more fruitful and much more productive than one producer working on it alone. You must bear in mind, even though we would go to one of our competitors and ask him for the latest information they have, we might be missing certain information that they would feel was confidential, which information would undoubtedly come out if coordinated and consolidated effort in the field was made.

MR. WALKER: I am also Chairman of the Ohio River Valley Water Sanitation Commission, which contacts eight states. We have been working there since 1948 on these various problems at various times with industry, and we have had committees representing all of the people in the Ohio River Valley, not nation wide, who are concerned with each of those general types of industry, and we have not come down to a source of classification of soda ash manufacturers. We have chemical committees, coal committees, plating industry committees, and steel industry committees, and I would say we have accomplished something in attempting to coordinate a study on these problems by all the people brought in.

In some instances, particularly in this

question of acid mine waste, and I don't mean to get off the track, but we think we have made a very definite step in that very recently, and we have done it only because we have been able to get all the people in that industry to work together. I think there is an instance where Public Health Service could do some good by bringing about some coordination of efforts on the part of all the people in this particular industry. I certainly would welcome anything that is done along that line.

We have not accomplished an awful lot in some particular segments of those committees, but we have accomplished something. I think it could be valuable here.

CHAIRMAN STEIN: I know this question will be asked. Do you think, Mr. Block, that if the National Technical Task Committee undertook this, that the Olin Mathieson Company would be prepared to cooperate with it?

MR. BLOCK: Sure. We are prepared to cooperate with all agencies for any betterment, whatever it may be, and cooperate to the best of our ability.

CHAIRMAN STEIN: And cooperate with the other industries?

MR. BLOCK: Certainly, any group.

CHAIRMAN STEIN: I think if this is agreeable to Mr. Walker, I think this suggestion of Dr. Hutcheson's is a very good suggestion.

MR. WALKER: I think it is a very good suggestion.

CHAIRMAN STEIN: Are there any other suggestions?

MR. CHAPMAN: I would think the suggestion of Mr. Block that the Public Health Service bring its data up to date could be done. Would you like to comment on that, Mr. Kittrell?

MR. KITTRELL: I would like to say, I used the data from 1952 through 1956 because that was the period when most of the data was available. There has been a great deal of study of this problem all the way from Saltville on down to Knoxville, and most of the data, what appeared to be better data, was available for this period.

We do have records, monthly records, from Olin Mathieson plants submitted to Virginia Water Control Board up to the present time and within the last two or three months. Those records do not indicate any significant reduction in calcium chloride during the years since the period I used.

I have some other recent data which I could review, I haven't done it so far, which would indicate whether or not there has been any significant reduction in the fluctuation of concentrations. There is a possibility this may have been accomplished through better control of waste proportions at Saltville. I have not gone into that. If I went into those, I might come up with different ranges of concentrations at various points downstream and better control of waste discharge. I do not think there has been any significant reduction in the total waste discharge.

MR. BLOCK: We think the data should show up materially better from Olin Mathieson's standpoint.

MR. STEIN: We will check that. The reason I didn't ask Mr. Kittrell questions in the proceeding, this is not a hearing, and I think that we generally would have asked him if he believed, in his opinion, the situation was about the same today. I think in the presentation of the data, using those figures, Mr. Kittrell used them, as I understood, to sort of give a complete and typical judgment, and believe that the discharges were the same today -- this represented the picture. I don't think he used that data to represent the concurrent

picture.

This is a question of opinion. If there is a question, and this is one of the areas, I am sure we can get together before our next meeting.

MR. ROZNOY: My name is Roznoy.

I have one set of figures here. In the report that Mr. Kittrell gave this morning, I believe he indicated at Knoxville the total hardness was 204 parts per million. The data indicates -- I might say this is T.V.A. data for '58 and '59, and some of our own up until July, 1960 -- indicating the average hardness for those two and a half years was 153 parts per million. That is 204 versus 153.

Now, first, this reduction, I think, plays an important part, particularly if you are quoting statistics with reference to economics as was done this morning.

The figure indicated this morning at Knoxville in chlorides was 88 parts per million. The 1958-59 and '60 data indicates the chlorides are average 51 parts per million. There is quite a bit of difference. Now this reduction has undoubtedly come about by closer regulated discharge. I think that fact has been brought out, that as of 1957, I think Mr. Block stated, the plant became more cognizant of the discharge and made considerable efforts to reduce this. That is the reason why Mr. Block indicated he would like to see Mr. Kittrell bring this data up to date.

MR. WALKER: Could I ask a question of Mr. Davis or Mr. Otis -- if they have any other comments? They are our technical brains.

CHAIRMAN STEIN: Yes.

MR. PAESSLER: I would like to say that my only comment would be, I think I would agree that regulation on a closer basis at Saltville has undoubtedly improved

the concentration picture, not only from the standpoint of ups and downs, but on an average basis further downstream. The question of what these actual values are would take a study on the part of our staff of the actual data. I would be inclined to agree with the company that there has been some improvement.

CHAIRMAN STEIN: May I make a suggestion?

I think what we are dealing with are physical facts, and there shouldn't be any controversy at all; and in the preparation for the next meeting that we have here, the next session of the conference, it might be well if all could agree on one set of figures. I don't think that would be too difficult to do. Do you?

DR. HUTCHESON: Yes, if I may interrupt you, sir.

I think there is some difficulty there. Mr. Roznoy presented some interesting figures. Let me put it this way. I don't think there should be any disagreement in figures that are produced; they should be the same, but the conclusions we draw from the figures certainly will show some difference of opinion, because I can't see how, if we are basing our discussions on average, as Mr. Kittrell did, we can draw a conclusion that the process of a better managed discharge would affect the averages so vastly. If Olin Mathieson is discharging the same quantity daily, there may be a factor in there -- I hope there is -- of an increased, or let us say a better managed discharge by T.V.A. of the flow that would reduce the volumetric average that we would get in these various chemicals. But if they are discharging the same amount, and there is the same amount of water, the average is going to remain constant, I would think, within reasonable limits.

MR. ROZNOY: This would depend on how many samples and how many in each case the averages were based on.

DR. HUTCHESON: We should have no disagreement at all in figures. There might be some difference of opinion.

MR. ROZNOY: Doctor, you are right in this, in reducing the maximum to a minimum, bringing the average at one point closer to the straight line. In other words, eliminate the humps. What the City of Knoxville gets on an average is dependent to an extent on the number of humps, plus the control on the part of the T.V.A.

DR. HUTCHESON: I would like to see a management program between the industry and T.V.A. taking into consideration rainfall so that the average, the median and the mean, would all be on the same point of the curve.

MR. KITTRELL: I have some data that may help to throw some light on the differences we are talking about.

In the first place, Mr. Roznoy, when you quoted figures at Knoxville, you meant the figures at its mouth rather than at the Knoxville intake?

MR. ROZNOY: I believe you are correct.

MR. KITTRELL: Now, I think a great deal of the difference in concentrations that we are talking about can be accounted for by difference in the stream flow during the periods we are dealing with, for the period 1952 to 1956, the average annual flow of the Tennessee River at Knoxville was slightly below the average annual flow of record. The flow during those five years, the average annual flow was 10,240 c.f.s. The average annual of record at Knoxville for the Tennessee River is 12,800. I do not have an average annual flow for 1959, but for 1957 and 1958 the average annual flow for those two years was 16,000, which is about 25 per cent above the average.

CHAIRMAN STEIN: Do you want to say anything

to that?

I do think that these can be resolved if the people get together, and I would say before the next one, I would suggest that we go over them, certainly before conclusions are made. I think on the basic facts, we can come up with a usually agreed statement. There shouldn't be any problem to that.

Are there any further comments or questions?

If not, I would like to thank you all for coming and participating. I do think we have made considerable progress in getting a method of operation going. I think in the past, as proved, we have been successful in resolving problems.

I would like to say to the people here now that we have been in many, many pollution control cases, and when the federal government comes in, you always have a hard lot. We have been in many pollution control cases where the solution was much, much, more remote than this one, and after a little work, we have come forward and come up with something. The way I look at this, I am an optimist with Mr. Walker. I believe that industry, primarily industry, because they are the ones most concerned with the problem and their responsibility, the regulatory agencies in the state, and the federal government put their minds to this, I am sure we will come up with a program at the next meeting, which will lead to an equitable solution to both Tennessee and Virginia.

Thank you.

APPENDIX A.

NAME	ORGANIZATION
Murray Stein	U.S. Public Health Service Washington, D.C.
F. W. Kittrell	U.S. Public Health Service Cincinnati, Ohio
Dr. W. H. Aufranc	U.S. Public Health Service Region IV, Atlanta, Georgia
Howard W. Chapman	U.S. Public Health Service Region IV, Atlanta, Georgia
Harold C. Taylor	U.S. Public Health Service Region IV, Atlanta, Georgia
R. W. Buck	U.S. Public Health Service Region IV, Atlanta, Georgia
Lloyd W. Gebhard	U.S. Public Health Service Region III, Charlottesville, Va.
William A. Rosenkranz	U.S. Public Health Service Region III, Charlottesville, Va.
Donald Townley	U.S. Public Health Service Region VI, Kansas City, Missouri
Dr. R. H. Hutcheson	Tennessee Stream Pollution Control Board
William J. Stearns	Tennessee State Planning Commission
Joe P. Walters	Tennessee Division of Industrial Development
M. A. Churchill	Tennessee Valley Authority Chattanooga, Tennessee
Fred W. Stanberry	Tennessee Game and Fish Commission
Ross Walker	Virginia State Water Control Board
A. H. Paessler	Virginia State Water Control Board
R. V. Davis	Virginia State Water Control Board
James Otis	Virginia State Water Control Board

APPENDIX A. (Cont'd)

NAME	ORGANIZATION
C. R. Marsh	City Manager, City of Kingsport
M. L. West	Public Works, City of Kingsport
A. B. Coleman	Kingsport Chamber of Commerce
R. L. Collins	City of Kingsport, Tennessee
E. L. Forbes	Holston Defense Corporation Kingsport, Tennessee
Major Raoul P. Valenzuela	Holston Ordnance Works Kingsport, Tennessee
James B. Nix	Holston Ordnance Works Kingsport, Tennessee
L. W. Roznoy	Olin Mathieson Chemical Corp. New York
E. Block	Olin Mathieson Chemical Corp. Baltimore, Maryland
C.C. Hightower	Olin Mathieson Chemical Corp. Baltimore, Maryland
E.I. Hawkins	Knoxville Utilities Board Knoxville, Tennessee
John J. Quinn	Knoxville Utilities Board Knoxville, Tennessee
S. A. Johnson	Public Health Department Washington County, Tennessee
J. W. Erwin	Sullivan County Health Dept. Sullivan, Tennessee
Ralph A. Smith	Fulton Sylphon Division Robertshaw Fulton Controls Co. Knoxville, Tennessee
R. W. Smith	American-Saint Gobain
Mayland H. Muse	Tennessee Conservation League Johnson City Chamber of Commerce
Everett Severs	Morristown Water System
Fred V. Scott	Champion Paper & Fibre Company Canton, North Carolina